PROCEEDINGS 2026-06
Program on Political Economy

Maximizing Benefits from Investments in Science, Technology and Innovation for Development

Moving Filipinnovation Forward: Proceedings of a Roundtable Discussion

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22 February 2024 | 1:00 PM to 4:00 PM

National Engineering Center, University of the Philippines Diliman
Diliman, Quezon City

Edited by Fortunato de la Peña

UNIVERSITY OF THE PHILIPPINES
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"The Makati City skyline at night, representing the financial hub of Metro Manila."

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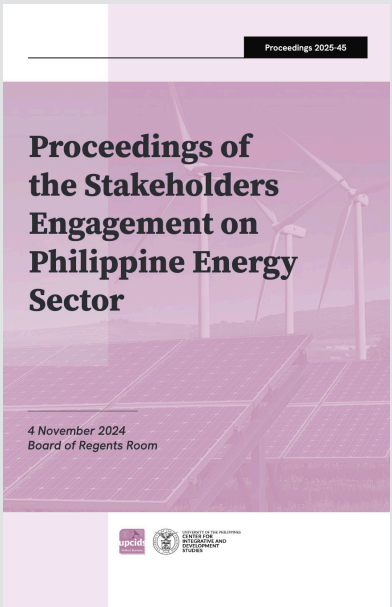
PROCEEDINGS

Building and Gaining National Capability in Science, Technology and Innovation: Moving Filipinnovation Forward—Proceedings of a Roundtable Discussion



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Introduction

The Political Economy Program (PEP) of the University of the Philippines Center for Integrative and Development Studies (UP CIDS) has included the development of policy recommendations on Science, Technology and Innovation (STI) for Development in its 2023–2024 activities. With the support of Fortunato de la Peña, former Secretary of the Department of Science and Technology (DOST) and PEP Senior Research Fellow, UP CIDS-PEP organized a two-part roundtable discussion (RTD) series titled "Moving Filipinnovation Forward," in collaboration with the UP Diliman College of Engineering, aimed at formulating these policy recommendations.

The term "Filipinnovation" was coined to describe the first National Innovation Strategy Document, developed by a multisectoral group in 2007. The said document was presented to and accepted by then-President Gloria Macapagal Arroyo in November 2007. Since then, "Filipinnovation" has been used to refer to innovation initiatives by agencies, organizations, businesses, and civil society groups operating in the Philippines.

The RTDs were held on 22 February 2024 and 27 February 2024. The discussions focused on "Maximizing Benefits from Investments in Science, Technology, and Innovation for Development" and "Building and Gaining National Capability in Science, Technology, and Innovation," respectively.

The event followed a format, starting with opening remarks, followed by a keynote presentation, discussions led by invited experts, comments from guest reactors, an open forum, and ending with closing remarks. Dr. Antoinette Raquiza, Convenor of PEP, served as the facilitator and moderator for the RTDs.

Opening Message

Angelo Jimenez
President, University of the Philippines

UP President Angelo Jimenez, after greeting the participants of the roundtable discussion and thanking the resource persons and reactors, shared several observations that he said need to be addressed. These include the overly low-key approach to pitching students in technology innovation to the business sector, the seemingly knee-jerk reaction from concerned sectors to any foreign influence in the education system, the apparent lack of self-assurance or basic self-confidence in facing the global community, and the under-investment in research and development (R&D) in the Philippines. He stated that allowing foreign investments in education, particularly higher education, is not prohibited by the Philippine constitution, although foreign ownership should be limited. For Jimenez, knowledge, expertise, and education know no nationality, and that the requirements for foreign professors, scientists, and researchers to work in the country should not be overly restrictive.

Jimenez then highlighted some good news that Filipinos should be proud of: the story of Dado Banatao, a Filipino engineer from Cagayan who played a key role in developing microchip technology. He also shared that the Philippines ranked 56th out of 132 countries in the 2023 Global Innovation Index. The country is recognized for its ability to rise up the ranks of innovative nations despite its level of development. Jimenez shared his initiative to make a three-hectare land grant in La Carlota productive through innovative agricultural systems and strategic partnerships. He shared that he has instructed university officials and concerned offices to ensure that the land grant generates income and supports initiative for climate change adaptation, disaster risk reduction, biodiversity protection, and the promotion of the sustainable development goals (SDGs). In this regard, he sought the assistance of UP College of Law to set up novel types of corporations, enabling UP to invest, particularly in technologies developed within the university. He believes the university's corporate powers have not yet been fully utilized.

Additionally, Jimenez shared with the RTD participants the funding difficulties that the University is facing, particularly in finishing its multiyear infrastructure projects. According to him, the total cost of the various ongoing

infrastructure projects is nine billion pesos. Of this, three billion pesos is needed or can be absorbed in 2024. However, UP got only fifty-two million pesos from the National Expenditure Program (NEP). With the help of university alumni in both the upper and lower houses of the legislature, the requested three billion pesos was approved, and an additional 0.5 billion pesos was added.

Jimenez stressed his administration's plan to invest in areas related to science and technology. The additional 0.5 billion pesos is intended to serve this purpose. He wants to push for innovation in areas that have received little investment. He cited projects that were planned long ago but still needs to be pushed forward, such as the special economic zone (SEZ) in UP Los Baños (UPLB), the Philippine General Hospital (PGH) in UP Diliman, and the Philippine Genome Center (PGC)'s extension program. In the case of the PGC, Jimenez cited the following specific targets: the mapping of the Filipino genome (Filipi-gnome) for all ethnicities to predict susceptibility to health conditions like cancer or heart attacks, as well as the administration of precision medicines.

Jimenez then addressed the shortage of research scientists and engineers in the country, which he considers the most important issue to tackle. He attributes this to the lack of real industrialization in the country, which could absorb the domestic workforce. Technical professionals, like engineers, receive good offers to work abroad. Japan hires even fresh graduates, while Australia allows for visa-free employment. According to him, engineering graduates in the Philippines have very low market leverage as far as wages are concerned simply because there is not enough industries in the country that demand their skills.

Jimenez then linked the need to increase the number of science and technology researchers per million population to UP's new vision of collaborating with other universities and colleges. He explained: "UP has to expand its reach to other schools. UP has to be a university of universities. It has to be a research hub of research hubs."

He also recalled that more than a hundred years ago, UP was created as the apex of the public educational system, He quoted Murray Simon Bartlett, the first UP President, who said that UP can best serve the world by first serving the Filipinos. "There were no other public higher educational institutions then, but today there are many," he noted. "UP is here to introduce higher standards for the country."

The UP President also shared new developments and plans for the UP campuses. He highlighted the need to produce more engineers at UP Mindanao, the decision to grant UP Tacloban autonomy, the goal of increasing the number of PhD holders among the UP faculty, and the goal of having more graduate students in master's and PhD programs at the more advanced campuses, namely UP Diliman, UP Manila, UPLB, and UP Visayas. He also said that if UP can help improve the level of undergraduate education in other state universities and colleges (SUCs) or HEIs through collaboration, the feeder base for the graduate programs and the research institutions will expand.

Before ending his opening message, he mentioned that he requested his executives for a list of 100 wisest Filipinos alive today, for potential conversations at UP and as possible members of a UP Industry Advisory Council (by sector). He also emphasized the need for UP to penetrate the microchips ecosystem given the importance of microchips in modern life. He then highlighted resources that can be used to the country's advantage, including the youth population and available natural resources. However, he added that an all-UP approach to innovation is needed for greater efficiency, energy conservation, and to restore a sense of mission, joy, fulfillment, and purpose within the University community.

KEYNOTE PRESENTATION

Maximizing Benefits from Investments in Science, Technology and Innovation for Development

Fortunato T. de la Peña

Chair, Philippine Foundation for Science and Technology
Former Secretary, Department of Science and Technology
Former Vice President for Planning and Development, University of the Philippines

Professor Fortunato T. de la Peña, former Secretary of the Department of Science and Technology, began by thanking UP President Jimenez for sharing his vision for the University. He also expressed happiness that the term "Filipinnovation," first introduced in 2007, has finally received the recognition it deserves. He said he readily accepted the role of Senior Research Fellow at PEP-UP CIDS because he was confident that progress could be made in the science and technology sector. He highlighted that the institutions capable of contributing to the advance of science and technology have long existed, supportive organizations are found across the country, and there is a wealth of experience among those who have worked in the sector for many years.

The first topic proposed for the RTD is "Maximizing Benefits from Investments in Science, Technology, and Innovation for Development." He explained that exploring this topic will help meet the objectives of formulating or recommending policies aligned with the theme "Moving Filipinnovation Forward." Meanwhile, the second RTD session will focus on "Building and Gaining National Capability in Science, Technology, and Innovation."

He started his presentation with a brief historical overview of science and technology in the Philippines. In the early 1900s, investments in science and technology in the Philippines began with the establishment of scientific and technological services as well as laboratories during the American period.

There were also human resources development and R&D. Additionally, during this early period, the government supported research institutions, including the Bureau of Science that evolved into the National Institute of Science, then became the National Institute of Science and Technology. Today, it is known as the Industrial Technology Development Institute of the Department of Science and Technology (DOST-ITDI). Its Philippine Journal of Science (PJS), which started in 1906, has not missed an issue up to this day. The collection of PJS is housed at the DOST Science and Technology Information Institute (DOST-STII).

The University of the Philippines (UP) was established in 1908. However, several units or colleges had existed even before that, including the College of Medicine and the School of Nursing. The College of Veterinary Medicine was established in 1908, the College of Agriculture in 1909, the College of Engineering in 1910, and the College of Pharmacy in 1914. These academic units were among the first to offer instruction and conduct research in the fields of science and technology.

The National Research Council of the Philippines (NRCP) was established in 1933, marking one of the first instances of government resources being allocated to be used for R&D in different sectors. The year 1958 saw the setting up of the National Science Development Board (NSDB) that, in 1982, evolved into the National Science and Technology Authority (NSTA). Through an Executive Order, NSTA became the Department of Science and Technology (DOST), a cabinet department, in 1987. Today, DOST is the primary science and technology agency of the country. It consists of a central office, regional and provincial offices, research and development councils, R&D institutes, science and technology service institutes, and attached advisory bodies, such as the National Academy of Science and Technology (NAST) and NRCP.

Public or government investment in science and technology is reflected in the budget. Over the past ten years, this investment has ranged from 0.33 percent to 0.47 percent of the national budget, never exceeding 0.5 percent. Nevertheless, there has been an increase in budget for science and technology, from 17.8 billion pesos in 2015 to 27.2 billion pesos in 2024. It is important to note, however, that inflation has also been a factor in this increase.

Meanwhile, simplifying the allocation percentages remains difficult. It is not easy to accurately segregate the amounts invested in laboratory facilities, infrastructure, and central office administration. Lumping these together with R&D, the resulting figure appears to be the biggest portion. This amount is

used within the DOST and as grants to other institutions. Additionally, 37 percent goes to human resource development (HRD), which is also quite substantial.

When undergraduate scholarships in science started in the early 1960s, fewer than 100 students were accepted. Today, the number of new freshmen undergraduate scholars in Science, Technology, Engineering, Mathematics (STEM) has grown to around 10,000 to 11,000 annually. Graduate scholarships have also expanded, increasing from a few hundred to over 4,000 per year. Additionally, there are also non-degree training programs, particularly to help industry. The Philippine Science High School, which started in 1964 as a single campus, now has sixteen campuses as mandated by law. There is even a proposal to allow some regions, particularly those with larger populations, to have two campuses. These developments stem to the relatively high percentage of the DOST budget allocated to HRD. In addition, nine percent of the budget goes to scientific and technical services, including standards, tests, and quality assurance that are done by almost all research and development institutes of DOST. Lastly, a portion of the budget goes to environment monitoring. VOTE, an acronym for Volcanoes, Oceans, Typhoons, and Earthquakes, is an area that requires ongoing monitoring research and forecasting.

Indicators of Benefits from Investments

What indicators of benefits from public investments should be maximized? These include intellectual property as well as new knowledge generated, particularly those that are published. Outputs and technologies resulting from R&D are expected to be utilized, applied, and commercialized. These outputs can be categorized into two groups: the first includes technologies for public good, and the second are those that can be commercialized. As an example, outputs or technologies that we want farmers to adopt fall under technologies for public good, while others are those that can be transferred to specific companies for commercialization.

Improvements in productivity and quality are also indicators of benefits from investments. One of the programs implemented by DOST all over the country is the Small Enterprise Technology Upgrading (SETUP) Program, and its major indicators include productivity and quality, in addition to increased firm income from sales. Technology-based enterprises that were set up and are now fully operational, as well as start-ups created with the help of public investments, are also indicators of benefits from investments. Additionally,

the number of science and technology professionals produced—particularly those engaged in R&D, teaching, training, and scientific and technological services—is another key indicator. Some indicators have been traditionally monitored, such as the UNESCO indicators—the R&D expenditures as a percentage of Gross Domestic Product (GDP) and the number of researchers per million population. The Philippines has always been below the average of one percent R&D expenditures relative to GDP; however, there has been progress in achieving the target of 380 researchers per million population.

As for intellectual property indicators, these include patents, utility models, industrial designs, and copyrights. The numbers have improved, particularly for utility models and industrial designs, but obtaining patents is still a slow process. Industry-related indicators, such as productivity through technology, value-added in manufacturing and services, net business formation technology-based manufactured exports, and R&D utilization and commercialization rates, are also being monitored.

Meanwhile, DOST R&D councils have reported that the percentage of commercialization is still low, with some still at only 10 percent. Likewise, human resource indicators, such as the number of researchers, teachers, and entrepreneurs with advanced degrees, are still low. The number of DOST scholars graduating with MS or PhD degrees have been increasing, but the challenge lies in where will they go after graduation. This remains very difficult for many reasons; first, there are no additional positions in government and universities to absorb them. Furthermore, the number of private companies conducting R&D in the country is still minimal. Big companies conduct their R&D in their home bases, while small companies seldom do R&D.

Today, DOST uses a set of indicators to evaluate projects submitted for funding. These include the 6 P's and 2 I's.

The 6 P's:

- P – Product or Process
- P – Intellectual Property/Patent
- P – Scientific Publication
- P – People (Those who earn their advanced degrees with the help of R&D projects)
- P – Policy

P – Partnerships

The 2 I's:

I – Economic Impact

I – Social Impact

Origin of Filipinnovation

Following the buzz words "productivity" and "quality" came "innovation." Innovation refers to something new that can be used. In the science and technology sector, these are referred to as technology-based innovations. In 2007, a multisectoral group from the government, industry, and academe came up with the first national innovation strategy, which they called "Filipinnovation." The leaders of the group were DOST, Intellectual property Office (IPO), the Asian Institute of Management (AIM), and the Philippine Chamber of Commerce and Industry (PCCI). For ten years, DOST informally led the Filipinnovation network. Afterwards, the Department of Trade and Industry (DTI) took over the leadership of this network.

The term "Filipinnovation" was essentially used for branding Filipino Competitive Innovation for Sustainable Development and Global Positioning. Different countries at that time had special names for their national innovation strategy. For example, India adopted "Innovation India." Credit for suggesting the word "Filipinnovation" is given to AIM, which included former Department of Foreign Affairs (DFA) Undersecretary Federico Macaranas.

In November 2007, the Philippine Innovation document was presented to President Arroyo. The four pillars of Filipinnovation, as contained in the National Innovation Strategy of 2007:

1. Investing in human capital
2. Supporting business incubation and acceleration efforts
3. Improving the innovation policy environment
4. Upgrading the Filipino mindset

Legislation enacted to support Filipinnovation are as follows: the Technology Transfer Act, passed in 2009 (although the Implementing Rules and Regulation

came out in 2010); the Innovative Startup Act and the Philippine Innovation Act, both of which came out in 2019; the Provincial Science and Technology Office Act, which institutionalized the work of people in the provinces; and the Magna Carta for Science and Technology Workers. Under the Magna Carta for Science and Technology Workers, the leave that researchers take to create start-up companies based on their research will be counted as continuing service. The law also specifies the minimum share that researchers will receive from the economic benefits out of their intellectual property. Meanwhile, other legislation led to the establishment of new S&T organizations, including the Philippine Space Agency. There are also other bills awaiting action.

Innovation Index Rankings

There are international rankings focused on innovation. The Global Innovation Index, for example, conducted by the World Intellectual Property Organization (WIPO), INSEAD[1] of France, and Cornell University, is released annually. From a ranking of 100 out of 125 economies in 2014, the Philippines rose to 51st out of 131 economies in 2020. The country was featured by WIPO as a good example among developing economies. Additionally, there is now a Global Startup Ecosystem Index, which ranks cities. Four Philippine cities—Manila, Cebu, Davao and Cagayan de Oro—have ranked well in this rating.

Amidst limited resources and the demand for public accountability, the concern now is improving or maximizing the benefits derived from investments in STI for development. This is particularly true for public investment. A related concern is hastening the build-up and development of national capabilities for science, technology, and innovation. These concerns need to be addressed to attain strong global positioning in business through science, technology, and innovation.

1 INSEAD stands for Institut européen d'administration des affaires.

Discussion 1

Dr. Emil Q. Javier

National Scientist
Former Minister of Science and Technology
Former President, University of the Philippines

Dr. Emil Q. Javier, the first discussant, commended President Angelo Jimenez's ideas, plans, and vision of UP, especially regarding the maximization of benefits from investments in science, technology, and innovation. He also mentioned that since the tenure of Prof. de la Peña as head of DOST, there has been significant momentum in the area of innovation. He then acknowledged Prof. de la Peña and Dr. Lydia G. Tansinsin, who was at the RTD, for having devoted more than forty years of their careers to the country's science enterprise. Dr. Tansinsin was with NSDB since its establishment in 1958 while Dr. de la Peña was with NSTA as Officer-In-Charge (OIC) Head of Planning when it was created out of NSDB in 1981. In 1987, NSTA then became DOST. Dr. Javier also said that while he is credited as the founding director of BIOTECH, this was only on paper because, at that time, he was already the Minister of Science and Technology. It was, in fact, Dr. William Padolina who set up BIOTECH.

Dr. Javier then talked about the time he worked at the National Institute of Molecular Biology and Biotechnology (BIOTECH) in UPLB. He recalled that, for a long time, the biggest investments in science and technology in the country focused on agriculture and food, with UPLB receiving the bulk of these investments. Today, according to Dr. Javier, BIOTECH has at least fifteen registered and patented technologies.

In this connection, he discussed the case of one of the patented technologies, called Bio-N. Bio-N is a fertilizer that contains nitrogen-fixing bacteria isolated from *Talahib* (wild sugarcane). According to him, research began when it was observed that, after a volcano eruption in Zambales, the talahib grass was thriving. Researchers proceeded to extract the roots and isolated the bacterium. Later, field trials showed that if Bio-N was inoculated into rice and corn, it has an effect equivalent to two bags of urea in terms of these crops' yield performance. A bag of urea costs 1,300 pesos, so two bags of urea costs 2,600 pesos while the price of Bio-N is only 500 pesos per bag.

The University of the Philippines adopted what was then considered as the best business model. UPLB partnered with the Department of Agriculture (DA) to set up more than eighty biofertilizer mixing plants all over the country, with DA agencies, some progressive local government units (LGUs) and a few private investors as partners. However, after all those efforts, and after thirty years, biofertilizer Bio-N was, on average, supplying only 0.6 or 0.7 percent of the potential six to seven million hectares of area planted with rice and corn. Because of this experience, and after the passage of the Technology Transfer Act of 2009, UPLB entered into an agreement with a local private company called Agri Specialist[2], which specializes in animal additives and grain mixes.

Dr. Javier also shared another story about Agri Specialist. The owner, Mario Labadan from Los Baños, went to see Dr. Javier at his office to say that his company was being impacted by the African Swine Flu (ASF) and Avian Flu outbreaks. He then suggested that Labadan diversifies and venture into biofertilizers, bio stimulants, and crop regulators, which are the growth industries in the agricultural world. The entrepreneur followed his advice, talked to BIOTECH, and secured an agreement for the exclusive rights of a product, which at the time was not performing well. The agreement involved a five-million-pesos upfront payment to UPLB and three percent royalty on gross sales per year for ten years. Labadan then invested 200 million pesos in modern bioreactors capable of meeting 50 percent of the total demand for rice and corn. The entrepreneur is now planning to expand for exports.

Dr. Javier cited the lessons learned from this case:

1. The products produced by government laboratories are usually not immediately suitable for the market. In the case of Bio-N, it initially used charcoal as carrier; however, this was very messy, not standardized, and prone to contamination. Bentonite was later used as an alternative, but the adopting company realized that the market favored liquid fertilizer and so funded BIOTECH to reformulate Bio-N into liquid form.

2. Within the University's and DOST's legal and technology transfer offices, it takes a long time for contracts to be signed. Many offices and units are involved in the process. But with increased confidence, trust

2 To know more information on Agri Specialist, kindly view: https://agrispecialistinc.com/

and simplified procedures, future contracts will likely be completed in a shorter time frame.

3. Once a plan is set and proposals are received, it is better to prioritize those where the private sector is a co-signatory partner.

4. Government scientists and engineers should be encouraged to practice their professions in the private sector for specific purposes and duration, as stated in their terms of service, to gain exposure in real markets—as much as one day a week, for example. This will be beneficial both ways—the company gains immediately through a better product and improved quality, while the government also benefits as the collaboration aligns research priorities with the demand and prospects of the market.

Discussion 2

Dr. William G. Padolina

Chair, Board of Directors, EuroMed Laboratories. Philippines
Former Secretary, Department of Science and Technology
Former Vice Chancellor for Academic Affairs, University of the Philippines Los Baños

Former DOST Secretary William G. Padolina started his talk by addressing issues that the science and technology sector have long considered challenges.

He discussed the procurement "battle" on three fronts: during pre-procurement, where institutions need to shape up; in procurement itself, where he thinks the passage of the New Government Procurement Act (Republic Act No. 12009) will ease up some of the hurdles; and, during post-procurement, which involves customs duties and tariffs. He said that, after many years of procuring materials and equipment needed in R&D, the Tariff Commission has still not been able to sort out matters. The process takes time—the importer gets demerits, the enzymes and biologicals are destroyed, and even milk for children becomes spoiled.

He also mentioned the urgent need for other legislation, citing the long wait before the passage of the Virology and Vaccine Institute of the Philippines Act last year. This had been a concern for several decades, as the country continues to lack expertise in tropical diseases such as schistosomiasis and malaria.

The Biocommerce Market

As a chemist and a pioneer at UPLB's BIOTECH, Dr. Padolina focused on what he described as the biocommerce market—a particular sector of industry and trade where science and technology play a big role. The demand in this market comes from products related to health and wellness, taste as well as fragrance and beauty. He noted that whenever there is an economic depression, the health and wellness sector still thrives, particularly beauty products, because they offer an affordable way to boost one's mood and confidence. He added: "*Kung gusto mong magpakulay ng buhok o maglipstick, o magpabango, kaya mo 'yon*. [If you want to dye your hair, wear lipstick, or use perfume, you can afford it.] And it makes you feel good.

Dr. Padolina emphasized that, "this is just an overview of what we think we should really get into as a market, because we have a chance to develop the 'next generation product.' That's the message that I'm really sending here—it's got to be a next generation product not just substitutes for existing product." He then presented a list of emerging applications of biological resources.

Next generation products:

- Plant-based protein sources for the vegetarian market
- Flavors, colorants, spices, essences
- Fuel
- Drugs – from terrestrial and marine plants, animals and microorganisms
- Nutraceuticals
- Cosmeceuticals
- Biomaterials – like biopolymers
- Biological warfare agents – like weeds, poisonous plants
- Bioremediation/Phytoremediation

There is a large potential market for the application of biological resources, including medicinal plants, natural colorants, oleochemicals, as shown below:

- Medicinal Plants – Philippine natural and organic products had an estimated free on board (FOB) value of export goods of about 153 million USD in 2011. The major contributors to the growth of the sector are the medicinal plants/foods and the personal care categories.[3]

- Natural Colorants Market – The global natural food colorants market was valued at 1,625.79 million USD in 2020, registering a Compound Annual Growth Rate (CAGR) of 8.47 percent during the forecast period (2021–

3 "Natural Health Products," Department of Trade and Industry, accessed February 12, 2026, https://industry.gov.ph/industry/natural-health-products/.

2026). The market is focusing on the launch of innovative products for multiple industrial applications to maintain their relevance.[4]

- Oleochemicals – The global oleochemicals market was valued at 25,815.10 million USD in 2020, and is projected to reach 39,849.20 million USD by 2027. The market is expected to register a CAGR of 6.5 percent during the forecast period. The volume of oleochemicals in the market was 18,969,803 tons in 2020. Oleochemicals find application in the nutraceutical and pharmaceutical industry, as they can be used as thickening agents, preservatives, and emollients.[5]

Apart from biological resources for medical use, Dr. Padolina also highlighted the potential of plant-based protein. However, in the case of artificial meat, he was worried about possible competition from non-plant resources. Additionally, he mentioned flavors, particularly those derived from spices, and shared that there is a global shortage of '*labuyo*' (chili). He noted that local scientists have already developed large-scale production methods for these raw materials, including processing of the product.

For colorants, Dr. Padolina identified "*atsuete*[6]," which provides the needed red coloring. The red colorants currently available in the market are viewed with reservation, he said, because there is a potential for adverse effects. However, for atsuete, which has four varieties available in the country, local scientists have already done their research, particularly in extracting the red colorant.

As for the coconut, according to Dr. Padolina, it produces oleochemicals that have both functional and medicinal uses. It contains the only oil in the market that has a significant amount of B-medium chain triglycerides (BMCT). He mentioned that one of the best-selling cooking oils today is predominantly MCT, because it is a very healthy part of the saturated fats in coconut oil.

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4 PR Newswire, "Global Oleochemicals Market Report 2021-2027 Featuring Major Players from Indonesia, Malaysia and the Philippines," news release, September 9, 2021, https://www.prnewswire.com/news-releases/global-oleochemicals-market-report-2021-2027-featuring-major-players-from-indonesia-malaysia-and-the-philippines-301369090.html.

5 GlobeNewswire, "Global $39.84 Bn Oleochemicals Markets to 2027: Rising Use in the Cosmetic and Pharmaceutical Industries," news release, September 3, 2021, https://www.globenewswire.com/news-release/2021/09/03/2291373/28124/en/Global-39-84-Bn-Oleochemicals-Markets-to-2027-Rising-Use-in-the-Cosmetic-and-Pharmaceutical-Industries.html.

6 Atsuete, also known as Annatto, is made from the seeds of the achiote tree (*Bixa Orellana*).

Dr. Padolino, nevertheless, also pointed out that there is more promise in non-food items derived from biological materials, as the prices of food cannot be raised significantly. Non-food items, particularly fragrances and essences, could potentially have higher mark-ups for as long that they smell good. There is a continuous, never-ending search for new fragrances. Scientists from abroad have analyzed the Philippine '*Ilang-ilang*' in great detail, looking for a new scent to sell in Paris, from which they profited. Unfortunately, this shows how the Philippines misses some opportunities that require advanced thinking and technology. Today, he said, precision agriculture demands a lot of engineering and electronics. He then asked whether there is sufficient local capacity to develop products that can respond to these opportunities and be marketed globally.

Dr. Padolina added that foreign markets abroad sometimes look for trade barriers to prevent and limit the entry of products from other countries. This suggests that, as the country transitions, product development, production, and packaging systems must be taken care of so that shifting towards a circular economy would not work against innovations where investments are made.

Lastly, Dr. Padolina congratulated DOST, particularly its previous administration, for inspiring and supporting the National Academy of Science and Technology (NAST) in coming up with PAGTANAW 2050. PAGTANAW 2050 is a long-term planning document covering the period from 2021 to 2050, outlining a vision for the Philippines as a country of 145 million people. It is a serious work produced by the Academy. Dr. Padolina urged everyone to read the 320-page document, which details the country's future and the journey ahead. The aim of PAGTANAW 2050 he said, is to make sure that we come in terms of our identity as an archipelagic nation with vast maritime resources. This, he noted in closing, involves big challenges.

Discussion 3

Dr. Rowena C. Guevara

Undersecretary, Department of Energy
Former Undersecretary, Department of Science and Technology
Former Dean, College of Engineering, University of the Philippines Diliman

Dr. Rowena Guevara presented on the topic of "Maximizing Benefits from Investments in Science, Technology and Innovation for Development" as follows:

Investments in Human Resource Development (HRD) in STI

Approximately 35 percent of the DOST budget is allocated to S&T human resource development, supporting over 53,000 scholars each year across various fields of science, engineering, and science education. The program now boasts over 10,000 Master of Science (MS) and PhD scholars. From just 17 MS and PhD graduates in 2017, DOST has been producing 400 to 500 MS and PhD graduates annually in science and engineering since 2015. Additionally, DOST fosters collaboration with Filipino experts through R&D Leadership (RDLEAD)—a program that deploys nationally and internationally renowned scientists and researchers to various S&T institutions across the country's different regions—and through the Balik Scientists program, of which more than 50 percent typically come from UP. Moreover, the Project Smarter Philippines through Data Analytics, R&D, Training, and Adoption (SPARTA) was launched with a goal of conducting and improving data science in the country. UP experts designed the program, and within just one year, around 24,000 data scientists were trained.

In order to optimize the benefits from investments and strengthen the Philippine science, technology, and innovation ecosystem, Dr. Guevara emphasized the need for a National Harmonized R&D Agenda (NHRDA). This is because the government budget that goes into R&D is not only received by DOST. Agencies, such as the Department of Agriculture (DA), Department of Energy (DOE), Department of Health (DOH), and the Commission on Higher Education (CHED), also receive government funding for R&D. At the beginning of every national administration, various national agencies, the

academic sector, industries, and civil society come together to agree on what priorities to be included in the NHRDA. Key priorities in basic research and research on agriculture, health, energy, emerging technologies, climate change, and disaster risk management are outlined together under the NHRDA. Based on these priorities, funding agencies for R&D, such as the DOST R&D councils, make a regular call for project proposals. Normally, about 1,000 proposals are received per year, of which 200 are approved, considering the budget availability.

The Science for Change Program

The Science for Change Program became the flagship program of the 2016–2022 DOST administration. It features four (4) component programs, namely (1) the Niche Centers for R&D in the Regions (NICER); (2) the Collaborative R&D to Leverage the Economy (CRADLE); (3) the RD Lead Program; and, (4) the Business Innovation through Science and Technology (BIST) program. Additionally, DOST strengthened its research and development institutes (RDIs), where various R&D facilities, centers, and laboratories were established. Examples include the Advanced Manufacturing Center (DOST AMCEN) under the Metals Industry Research and Development Center, the Industrial Technology Development Institute, Regional Yarn Production and Innovation Centers (RYPIC) under the Philippine Textile Research Institute, Bamboo Musical Research Center, Flavor and Fragrance Research Center at the Forest Products Research and Development Institute, Radiation Research Center at the Philippine Nuclear Research Institute, Virology Research Facility at the Industrial Technology Development Institute, and the Omics Nutrition Laboratory at the Food and Nutrition Research Institute. An event of significance at the end of 2021 was the unveiling of a 12.5-foot, 3D-printed statue of Jose Rizal, a Filipino scientist, at the DOST Central Office Plaza in Bicutan, Taguig City. This statue, created by AMCEN, was unveiled to commemorate the 125th year of Rizal's martyrdom.

The 22 Tuklas Lunas Centers, which are located in universities across the country, differ from the NICERs in that they are all focused on the search for drugs based on knowledge or folkloric medicines—an area with much unfinished work. The last stages of the process involve clinical trials, which are very expensive. Unfortunately, DOST does not have enough resources to fund these trails. It is highly recommended that qualified universities undertake and fund these clinical trials, or that the private pharmaceutical industry sector

take on this responsibility, as the returns will benefit them (as prescribed in the Technology Transfer Act).

According to Dr. Guevara, in addition to the NICERs, RDI Centers and laboratories as well as Tuklas Lunas Centers, DOST is setting-up Technology Business Incubators (TBIs) as another strategy. This is in cooperation with other institutions, like universities, to push for the transfer of technology and to encourage the birth of technology start-up firms. This concept began in 1990, when then DOST Secretary Ceferino L. Follosco recognized the emerging importance of start-ups. However, after the pilot TBIs during the early 1990s, it was only in 2010 when it became a priority program of DOST.

Dr. Guevara presented the following statistics related to the RD Lead program, the NICER program, and TBIs, as shown in the following diagrams.

Figure 1. Key statistics and institutional frameworks for Science and Technology education and scholarship programs in the Philippines.

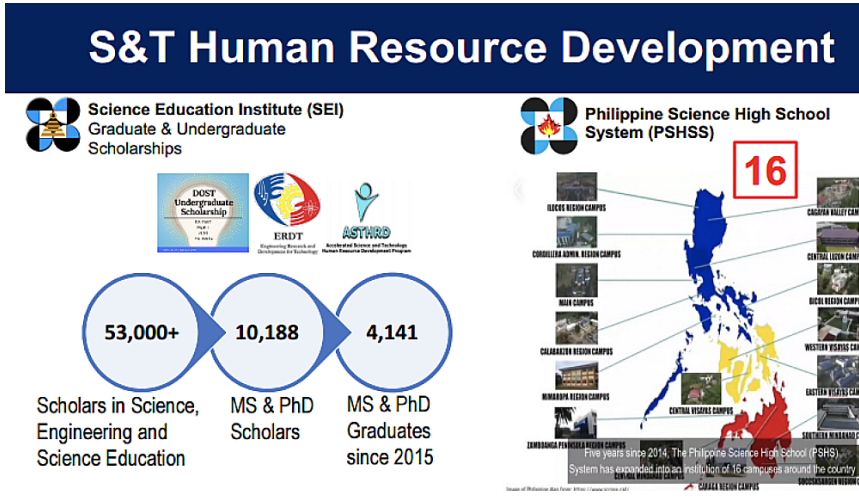


Figure 2. Summary of DOST human resource initiatives, featuring the expansion of the PSHS campus network and specialized programs including the Balik Scientist Program, S4CP, and SPARTA training.

Figure 3. The facilities shown in the diagram above were established within the DOST RDIs.

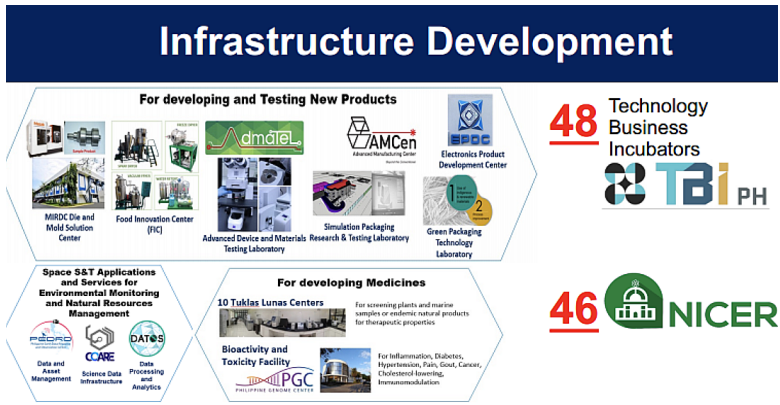


Figure 4. The NICERs are in universities across the country. With their current capabilities, they are solving problems that are immediate to their specific region. Nevertheless, within five years, they are projected to be able to contribute at the national level.

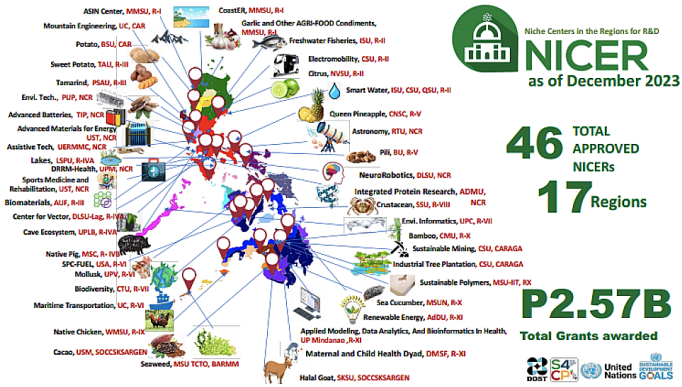


Figure 5. Nationally and internationally renowned R&D Leaders are fielded to different regions for one to three months. They help prepare proposals, establish laboratories, and oversee the implementation of approved R&D projects, among others. The R&D government funds are gradually distributed to different institutions across the country—following the vision of inclusive development.

Additionally, the CRADLE component of the Science for Change program has benefitted many private companies that lack R&D units within their organization, partnering instead with universities or research and development institutions (RDIs) to carry out R&D. These partnerships help them address their problems or develop their desired products and technologies with the help of DOST funding.

Finally, BIST, the last component program, have started targeting companies that want to set up their own R&D units. The initial beneficiaries were from the local pharmaceutical industry and food processing sectors.

From Intellectual Property to Production to Commercialization

According to Dr. Guevara, to facilitate the use of intellectual property for production, application, and economic activity, the DOST adopted policies that take off from the Intellectual Property Code, Philippine Technology Transfer Act, and other similar policies.

DOST Intellectual Property Related Policies

1. Intellectual Property Ownership Policy
2. Data Sharing Policy
3. Guidelines for the Fairness Opinion Board (FOB) and the Issuance of Fairness Opinion Report (FOR)
4. Technology Transfer Protocol for R&D Institutes
5. IP Management Protocol
6. Establishment and Maintenance of Revolving Funds of DOST RDIs

With clear laws and policies, applications for Intellectual Property (IP) Protection from the DOST-funded R&D increased from 15 per year to over 1000 per year within a period of five years. The Technology Transfer Act and its Implementing Rules and Regulations (IRR) contributed to increasing number of IP applications. Dr. Guevara then presented three cases in relation to the above-mentioned policies.

Case #1 The Carrageenan Plant Growth Promoter (PGP)

Through a DOST-funded R&D, Dr. Lucille Abed of the Philippine Nuclear Research Institute (PNRI) led product development. The product improved the yield of rice by 30 percent and some vegetables by 40 percent to 60 percent. The technology was later transferred to two private sector adopters. As the adopters gained significant returns, the researchers who developed the product also enjoyed economic benefits from the royalties.

Case #2 The RT-PCR test, which proved extremely useful during the COVID pandemic

A Philippine-produced RT-PCR test serves as an excellent example of an earlier R&D (initially for dengue) becoming useful when there was an urgent need for a COVID-19 diagnostic product. Dr. Raul Destura from UP Manila College of Medicine, the lead researcher, committed to developing the RT-PCR for COVID-19 testing within 45 days and successfully achieving this goal.

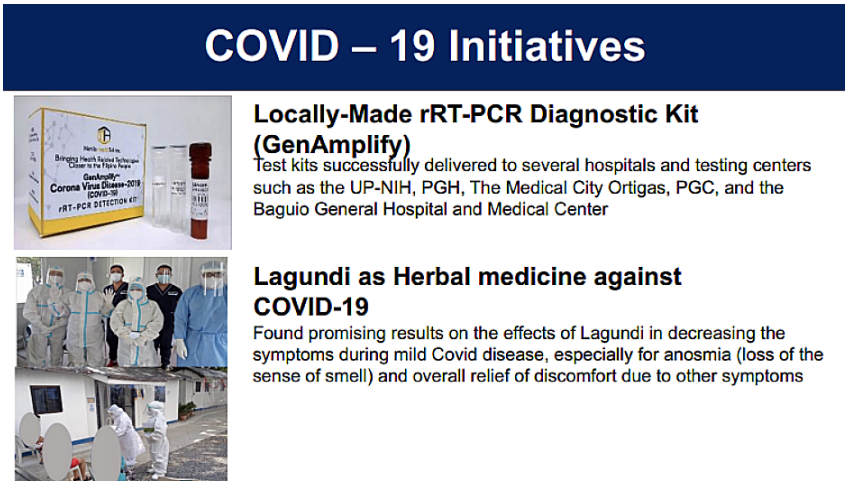
In the case of PGP, the model for commercialization was different. In this instance, the adopter of the technology is a start-up company established by UP researchers a few years before the COVID-19 pandemic.

Case #3 Lagundi, after its proven efficacy for cough and colds 25 years earlier

Lagundi tablets and syrup were adopted by a Filipino-owned pharmaceutical company after passing the critical trials in the early 1990s. UP Manila is credited for its development as a plant-based medicine. However, prior to the Philippine Technology Transfer Act of 2009, most of the royalty from the IP went to the institution that provided the R&D funds. In this case, it was DOST. After passing the Technology Transfer Act, the main beneficiaries of IP royalty are the R&D institution that conducted the research and the researchers themselves (around 40 percent goes to the researchers), while nothing goes to the institution that provided the research grant. UP Manila then requested that, even though the Technology Transfer Act was only effective to R&D conducted after its passage, the royalties received by DOST for Lagundi-based medicine be allocated to the R&D institution—UP Manila. In fact, even after the patent expired, UP Manila succeeded in negotiating for a high royalty payment because the clinical trials done were by the university.

Figure 6. The Carrageenan Plant Growth Promoter (PGP), developed by Dr. Lucille Abed (PNRI) through DOST-funded R&D. This technology increases rice yields by 30% and vegetable yields by 40%–60%, while inducing resistance to diseases and typhoons.

Figure 7. DOST-led COVID-19 Initiatives.



Dr. Guevara ended her presentation by offering answers to the question: "How can we improve benefits to cost of investments in STI for Filipino competitive innovation?" First, she urged the continuance of investment in human resources and pointed out: "*Hindi pwede na yung mga ina-attract nating mga company* [It is not enough that the companies we are attracting] are only those in manufacturing and assembly. We need to hire higher level experts."

Second, more startups from university laboratories should be produced. There must be a pipeline to bring out those technologies. "*Pag si professor hindi marunong ng business, huwag mong pwersahin. Baka mas magaling talaga siya sa laboratory. Humanap ka ng maglalabas sa na-develop niya* [If the professor doesn't know business, do not force it. They might be really good in the laboratory. Find someone who can bring out what they've developed in the market.]" according to Dr. Guevara.

Third, there has to be more collaboration with industry for technology transfer. If you involve industry in the research from the outset, you can better ensure that there will be an adopter for the technology.

Lastly, the adoption of technologies by mandated government agencies should be pushed or made mandatory. As Dr. Guevara noted, "*Dapat yung DA, bilhin niya yung product of UPLB. Dapat yung DOH, bilhin niya yung product of UP Manila.* [DA should buy the product of UPLB. DOH should buy the

product of UP Manila.] We should keep in mind that public money was used to develop these products."

In response to the question, 'How can we hasten the build-up of and gain from STI national capabilities for improved global positioning? Dr. Guevara provided the following answers: First, increase the R&D budget. She credited the Ninoy Aquino III administration for increasing the DOST R&D budget from one billion to eight billion pesos in five years. She expressed hope that this significant increase would be sustained. Second, on the RA 9184 or the Government Procurement Reform Act, Dr. Guevara says, "Do not make procurement a big problem for the researcher." Third, there should be more R&D-based industries. As such, she called on the UP alumni: "We need R&D-based industries because that is where the money is. The talent level of Filipinos is very high. We can see that among our Balik Scientists, who flourished when they were given the opportunity." Fourth, there is a need for global branding. Dr. Guevara stressed that there is a big global market for Philippine products. There is also a need to promote entrepreneurship through a combination of science, engineering, and business colleges, with the help of alumni.

Reactions

Engr. Roberto Batungbacal

Reactor 1

President, Samahan sa Pilipinas ng Industriya Kemikal
Manager, Philippine Manufacturing Revisited Advocacy Website

Engr. Robert Batungbacal shared the following statistics and experiences from the Philippine manufacturing sector and related them to science and technology:

1. From 2010 to 2013, the Philippines became the fastest growing manufacturing sector in Southeast Asia, according to Department of Trade and Industry (DTI).[7]

2. The Philippines has the 25rd largest manufacturing sector in the world, according to World Population Review.[8]

3. The Philippines ranked 56th out of 132 economies, according to the Global Innovation Index (GII) in 2023.[9] The country was ranked 4th out of 37 economies in the category of low middle income economies, following Vietnam, India, and Ukraine.

4. The Philippines ranked higher in the Output section of the GII, which has also an Input section. The reason for this is that Philippine industry has a high percentage of high-value production, particularly in the electronics and semiconductor sectors. As a result, there is an outsized performance in

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7 Data from United Nations Industrial Development Organization, Philippine manufacturing sector from 2010-2013 were expanded by 5.77 percent, compare to other ASEAN countries, with the average of 4.97%, and the global average was 2.17%. Retrieved from: https://industry.gov.ph/phl-mfg-sector-outpaces-global-growth/.

8 According to World Population Review in 2023, the total manufacturing value is $70.90 billion. Retrieved from: https://worldpopulationreview.com/country-rankings/manufacturing-by-country.

9 Source: from World Intellectual Property Office https://www.wipo.int/edocs/pubdocs/en/wipo-pub-2000-2023/.

the output compared to input, which covers our investments in research and training and human resource development.[10]

5. Nine out of the top 20 largest companies in the Philippines are manufacturers, including San Miguel Corporation and Petron.

6. Multinational R&D has pulled back from individual countries. Everything is now centralized in their home country, or in Singapore or Shanghai. As a result, many companies do not have R&D employees anymore, although they do have quality control (QC) units. Many firms believe that if they can acquire proven technology through licensing, there is no need for R&D. However, the Philippines is not just for assembly, as local human resources can do more.

Recent Experiences and Observations

Engr. Batungbacal recounted that during a meeting with Dr. Eric Paringit, the Executive Director of DOST's Philippine Council for Industry, Energy, and Emerging Technologies for R&D (PCIEERD), he brought up the need for solutions to plastic wastes. Director Paringit informed him that there were already many bioplastic researchers who needed private sector partners to secure R&D grants. They both decided to bring together researchers and industry professionals, and within a few months, they secured funding for two projects.

Engr. Batungbacal also shared his plans to gather around 30 professionals for a roundtable discussion on the Biobased Economy Roadmap by the end of 2024. This project focuses on biocommerce, as previously mentioned by Dr. William Padolina in his discussion. He added that the roadmap is important because the Philippines has both the technology and raw materials in the form of abundant biomass. He posed the question, "Which country is going to research the specific crops that the Philippines has? Of course, that includes coconut." He credited Filipino senior scientists, particularly those in biotechnology like Dr.

10 According to Global Innovation Index 2025. Source: https://www.wipo.int/edocs/gii-ranking/2025/ph.pdf.

Dolores Ramirez[11] (National Scientist) and Dr. William Padolina[12], for their research on areas where the country has a competitive advantage.

Engr. Batungbacal also mentioned the groundbreaking laboratory work of Dr. Rizalinda de Leon and Dr. Joey Ocon, chemical engineering professors, in the fields of green hydrogen, green ammonia, green ethanol, and other energy-related solutions.

Engr. Batungbacal concluded by stressing the need for greater collaboration among industry, academe, and government.

Engr. Alfonso A. Aliga, Jr.

Reactor 2

Executive Director, UP Engineering Research and Development Foundation, Inc. (UP ERDFI)
Former Partner, SGV

Engr. Alfonso Aliga began his reaction to the presentation by stating that his goal is to bring everybody back to reality and emphasized the need for a plan. He then introduced what he described as location-focused and enterprise-focused solutions, suggesting that national programs should be broken down into localized approaches.

He then shared a story that happened in Piddig, Ilocos Norte. Engr. Aliga explained that in Ilocos Norte, for instance, farmlands are as small as 100 square meters. However, the whole community works together to aggregate small farms into bigger plots, removed the bunds to allow mechanization, and made the use of the carabao more efficient for plowing. Additionally, they adopted the same hybrid of rice seeds and used the same fertilizer, but reconfigured irrigation canals. This was where the Sanjeras came in. The Sanjeras were farmer organizations that pooled their own resources to redesign the flow of irrigation canals, improving farm productivity and sustainability.

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11 "Dolores A. Ramirez," SPHERES, Department of Science and Technology, accessed February 12, 2026, https://spheres.dost.gov.ph/profiles/1005-dolores-a-ramirez.

12 "William G. Padolina, PhD: 2015 PFCS Awardee for Chemical Research," Philippine Federation of Chemistry Societies, July 13, 2015, https://www.pfcs.org.ph/updates/features/william-g-padolina-phd-2015-pfcs-awardee-for-chemical-research/.

The story above, according to Engr. Aliga, is an example of bringing science to the last mile. In this case, there was even no innovation involved. It is a case of "common science," which is science for the people. He pointed out that there are other similar experiences at DOST, where small-scale activities have direct impact to local communities. Engr. Aliga concluded his reaction by saying, "Community-based, location-specific projects do a lot of magic."

Atty. Rowel Barba

Reactor 3

Director General, Intellectual Property Office of the Philippines
Former Undersecretary, Department of Trade and Industry

Director General (DG) Rowel Barba began his remarks by reporting that 2023 was another record-breaking year for IPO Phil. He shared that the number of patent filings in 2023 surpassed those in 2019, which were considered pre-pandemic filings. In 2020, due to the COVID-19 pandemic, filings went down by 20 percent, but in 2022, the number of fillings had already exceeded the 2019 levels.

In terms of financials, DG Barba emphasized that IPO Phil is a self-sustaining agency, with no funding from the government. In 2023, IPO Phil exceeded one billion pesos in gross revenue. The agency will soon have its own office, funded by the income it earns as a government corporation.

He said that the government and, specifically, the IPO Phil recognizes the value of investing in science, technology, and innovation not only for economic but also for social development. The various laws and programs are being implemented to ensure a robust environment for innovation. The Philippine Development Plan, which was revised for 2023 to 2028, also reflects how the current administration aims to transform the economy through addressing the constraints in and advancing research and development, technology, and innovation. The commitment to invest in STI is reinforced with the creation of the National Innovation Council under the Philippine Innovation Act (PIA) or RA 11293.

This law was passed toward transforming the country into a smart and innovative Philippines. Because of its role in intellectual property protection and enforcement to foster innovation and creativity, IPO Phil was included as a member of the National Innovation Council.

DG Barba also noted that besides the PIA, there are several legal reforms being undertaken to support STI in the Philippines. This includes the Corporate Recovery and Tax Incentives for Enterprises (CREATE) Law. The CREATE provides incentives for the commercialization of IT and the establishment of innovation support offices (ISOs). He added that there are also proposed amendments to the IP code, which would allow the adoption of international best practices in IP protection and enforcement. These would include the recognition of non-traditional marks, allowance of provisional patent application and simultaneous applications (as done in patents), and strengthening of IPO Phil's enforcement powers.

Additionally, DG Barba enumerated some improvements in their operation. These include the following:

1. Incentive programs. The Juanna Make a Mark, Juan for the World, Juanna Design, Juanna Invent, and the Youth IP Incentive Programs aim to promote filing and registration of intellectual property both locally and internationally.

2. The SciTech Highway Agreement with DOST. This agreement ensures that when an IP application from either DOST or DOST-supported researcher reaches the IPO Phil Main Office, all requirements are already complete.

3. IPO Phil's 24/7 online services. IPO Phil's online services is now available 24/7; however, the system downtime is a recurring problem.

4. Sufficient ManPower for Quality Prosecution. Ensuring enough work-hours to maintain quality prosecution, implement IP awareness and capacity-building activities to different shareholders, and promote a strong national and international IP regime for the benefit of IP owners and holders in the Philippines.

DG Barba concluded his remarks by emphasizing that IP protection is a way to maximize returns on government investment in STI. There are many success stories of local innovation that have significantly impacted the economy and society. Conversely, there are also many cases of IP infringement that have negatively affected the productivity of local exporters and creatives.

Open Forum

Dr. Rowaldo G. del Mundo, Associate Dean for Public Engagement of UP Diliman College of Engineering, served as the moderator of the open forum.

1. **Mark Casillan, a UP College of Engineering alumnus, BSME 1959**

   Mr. Casillan cited improvements in the country's science and technology situation in terms of higher productivity, gross domestic product, purchasing power parity. According to him, he takes pride that, despite only having 1.6 million people running the government nationwide, the private sector is strong.

2. **Prof. Glen Imbang, a faculty member from UP Technology Management Center**

   Professor Imbang said that he found the presentations on the modern history of Philippine science, technology, and innovation comprehensive. He opined that the world has entered the post-modern age of science, technology and innovation, and that there is growing recognition of new ways of doing things: new ways of marketing, new capabilities, new resources, new patterns of organizations. The question thus is how can these be managed to ensure sustainability?

Closing Remarks

Dr. del Mundo gave a brief closing remark by thanking all the presenters, reactors, and participants of the RTD session. He also thanked the UP CIDS, particularly PEP, for facilitating the RTDs on "Moving Filipinnovation Forward." He expressed commitment on the part of the UP College of Engineering to contribute in achieving the goals, objectives, and targets of the UP System through science, technology, and innovation. He also expressed pride in the College of Engineering for partnering with CIDS to initiate these timely and relevant discussions.

Center for Integrative and Development Studies

Established in 1985 by University of the Philippines (UP) President Edgardo J. Angara, the UP Center for Integrative and Development Studies (UP CIDS) is the policy research unit of the University that connects disciplines and scholars across the several units of the UP System. It is mandated to encourage collaborative and rigorous research addressing issues of national significance by supporting scholars and securing funding, enabling them to produce outputs and recommendations for public policy.

The UP CIDS currently has twelve research programs that are clustered under the areas of education and capacity building, development, and social, political, and cultural studies. It publishes policy briefs, monographs, webinar/conference/forum proceedings, and the Philippine Journal for Public Policy, all of which can be downloaded free from the UP CIDS website.

The Program

The Political Economy Program (PEP) seeks to advance innovation-driven and equitable development through the conduct of problem-solving research on development policies and practice; the promotion of collaboration among the academe, government, industry, and other stakeholders in pursuit of inclusive technology and sustainable industrial policy; and the popularization of the political economy framework in the national conversations on policy options.

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