

# NAST PHL: Harnessing Science and Technology to Build the Philippines of the Future

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## ABSTRACT

In an increasingly technological world, global competitiveness and economic prosperity are closely tied to scientific advancements and innovation. This paper emphasizes the need for the Philippines to enhance its national system for innovation and leverage science and technology to drive progress. By recognizing the importance of high value-added products, strategic interventions, and private sector participation, the paper highlights the role of science and technology in poverty alleviation, agricultural competitiveness, and sustainable development. It advocates for the establishment of a strategic enabling environment, increased investment in research and development, cross-disciplinary collaboration, industry-oriented training, and the promotion of a culture of excellence. Furthermore, the paper underscores the significance of human resource development in building a skilled workforce capable of managing knowledge and adapting to technological advancements. Ultimately, this paper calls for concerted efforts led by the National Academy of Science and Technology, Philippines (NAST PHL) to harness science and technology for the nation's future growth and prosperity.

**Keywords:** global competitiveness, innovation, science and technology competence, investment incentive, cross-disciplinary, industry-oriented training

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*Academic Affairs. Dr. Padolina served as Undersecretary (1992-1994), Acting Secretary (1995-1995), and Secretary (1995-1999) of the Department of Science and Technology. Dr. Padolina joined the International Rice Research Institute where he held various positions and retired as Deputy Director General for Operations and Support Service in 2012. Academician Padolina served as NAST PHL's sixth President from 2012 to 2018.*

In an increasingly technological world, we are told that the competitive edge lies with those nations or companies who are either first or best: to open or conquer new markets, or pioneer in the development of next-generation products that will shape our lives the way telecommunications and antibiotics have.

Admittedly, the Philippines still has to reach a level of excellence in terms of scientific discoveries, innovation, and wealth creation. These are formidable tasks that our national system for innovation must face to provide, at the very least, the minimum basic needs for a growing population.

**The National Academy of Science and Technology Philippines and the country's S & T community should lead the way to push the country towards enhancing the role of the national system for innovation by harnessing the tools of science and technology to build the Philippines of the Future.**

Economic activity on the global scene is becoming increasingly knowledge-intensive. Science and technology provide the new knowledge for rapid and continuous improvements in products and manufacturing techniques, as well as, efficient marketing strategies, to give businesses a competitive edge. The capability to efficiently add value to goods or services is now the basis for competitiveness. The higher the value added, more and new wealth is created, bringing greater returns to the economy.

Therefore, any effort for global competitiveness requires a strategy to identify, produce, and market high value-added products.

Unfortunately, too little of the great power of modern science and technology has been directed at development. The various strategies to deal with problems found mainly in low and middle-income countries have not been very successful, and the S and T capabilities of these countries are far too limited to deal adequately with the enormous problems of

development. Their capacity to generate, acquire, disseminate, and use knowledge is limited. Furthermore, the tasks are made more difficult by the fact that globalization exposes humanity to processes that are dispassionate, brutally calculating, and fickle.

### **Promoting Innovation**

Establishing a strategic enabling environment for innovation, and eventually, competitiveness, especially in technology transfer and acquisition is vital in coping with poverty and globalization. The Philippines urgently needs to eliminate speculation and guesswork in our activities. The information to minimize uncertainty is derived from scientific work. The scientific process underpins risk management decisions involving many aspects of national life.

The containment and eradication of threats to human, animal, and plant health; weather forecasting; and correct time information are some examples of minimizing uncertainty. It is also science and technology that provides the basis for preventing non-tariff trade barriers fostered by protectionist lobby, from strangling world trade.

How can the Philippines translate this into solid, long-lasting interventions?

#### *1. Nicheing — Seizing the opportunities for change*

We need to niche because resources are limited; there is not enough for all. We cannot be winners in all areas. Rigorous market studies should be conducted to determine the competitiveness of Philippine products and services. But we must position ourselves to be agile, able to respond to every new opportunity that emerges in the global market. Regional/cross-border groups are rapidly shaping up. The individual or specific product niches of nations must be clearly understood.

## *2. Enlightened government intervention*

Leapfrogging to a free-market economy remains a debatable proposition for low and middle-income countries like ours because of the inability of the private sector to absorb and assume all the risks. The government will have to make it easier for the private sector to move forward. These include: ensuring a strong base of fundamental science; providing a business environment that fosters innovation and investment; investing in research that is critical to the economic and social needs of the nation but cannot attract private sector support; ensuring S and T security; and maintaining a certain level of self-reliance to allow us to add value to new knowledge and technologies transferred.

We should recognize that the market, left entirely to its own devices, is unlikely to guarantee an optimal level of research as evidenced by high rates of market failure and high start-up costs.

## *3. Increased private sector participation*

The sustainability and viability of any science base depend ultimately on the private sector and the preparedness of industry to invest in S and T. While the government is expected to establish the enabling environment for high performance, it is still the individual company that must compete. The ability to compete will be enhanced by its innovative capacity through R and D.

It is our science and technology competence that will enable us to manage knowledge. Scattered bodies of knowledge can be brought together so that people who use them can work faster and better. This will also enable us to establish structural intellectual assets, such as information systems, knowledge of market channels and customer relationships, and management focus; turning individual know-how into a property of the group. Unraveling lines of authority and laying out new ones will be the main task of the new knowledge workers.

It is therefore imperative to train a workforce with greater reasoning and mathematical skills who can master the complexities of new scientific discoveries and new process technologies. These intellectual resources can be used to transform businesses and create new models for global competition. It is about change, and its future depends on the ability to accommodate dramatic, often unexpected change.

## **High Technology and Poverty**

The conventional short-term, but politically attractive gains of poverty alleviation programs are indeed very tempting. They are valuable approaches, but they have their limitations in that they do not break the vicious cycle of squalor and want.

Human societies that have, by and large, found some solutions to liberate a major portion of their population from poverty have anchored their programs on productivity. And this is where modern science and technology can make significant contributions in providing inputs to a development agenda that is more strategic, knowledge-based, scientific, and long-term. Suffice it to say that scientists must in fact be part of the solution and not the problem. Our national efforts towards poverty alleviation will need, among others, trained people who are familiar with the frontiers of subjects and thus can help assess the potential of new processes and technologies. The Philippines must retain the capacity to identify and absorb emerging technologies which are the most solid instruments for human development.

Be that as it may, the shortcut to development is never science and technology alone, but in development itself.

## **On Competitiveness in Agriculture**

While it is clear to many that industry and services must be competitive, agriculture, because of its role in food security, is unfortunately politically perceived as something that need not or cannot be competitive. This defeatist attitude has caused many farming operations, terrestrial and marine, to be inefficient, with the farmer and fisherfolk feeling helpless and losing control of their activities. Government, on the other hand, fearful of social unrest, persists in providing short-term rescue measures that perpetuate the vicious cycle.

Another issue that affects our competitiveness is the way we manage our environment and natural resources. The harmonious relationship between maintaining levels of productivity and preserving the integrity of our environment can only be enhanced if we have an understanding of the impact of human activity on how nature operates. This includes studies on climate change, the regenerative capacity of natural ecosystem, and the earth's capacity to absorb waste. And at no other time

in the history of science are more and more secrets of nature being unlocked than now. The powerful tools of science and technology that enable us to see more, detect more, and sense more, should be harnessed to serve the purposes of defining sustainable productivity, especially at the farm level.

### **Role of Science and Technology in Development**

Science and technology competence as an investment incentive. Experiences of other countries show that it is the strength of the science and technology base which has attracted inward investment, and which encourages companies operating on a global scale to invest in R&D within a country. Science and engineering research are the basis for long-term wealth creation. The strength of the science and technology base is what, in the immediate and short term attracts global, high-tech industries to invest in a country.

Science and technology provide the innovation base for new products and processes. It is the magnitude and quality of activity in the research base that brings the capacity to develop expertise, new knowledge, new applications, and ultimately wealth creation. It is from the wider research base, including collaboration with R&D initiatives in other countries, that true innovations, which are usually unpredictable, emerge.

Science and technology enable us to identify and quantify risks to our biosecurity. The liberalized entry of fresh and processed food products from different countries introduces risks to our biosecurity— human, plant, and animal health, human nutrition, and the biodiversity of our genetic resources. The scientific process underpins the risk management decisions involving the containment and eradication of threats to human, animal, and plant health. It is science and technology which will ensure that any such risks are scientifically justified and are not disguised as a restriction on trade.

Science and technology provide the basis for preventing non-tariff trade barriers fostered by protectionist lobby from strangling world trade. In view of the continuing

relaxation of tariff for goods and services traded among countries, the remnants of the protectionist lobby that still exist in some countries continue to put up technical barriers to trade. The Philippines should establish a robust and reliable National Quality Infrastructure to ensure that both its exports and imports comply with the globally-accepted product standards. This will enable the traded products from the Philippines to deal with disputes in the guise of protectionism. For example, the principle of equivalence has an important role to play when it comes to weighing up issues related to trade barriers. Under the Agreement on the Application of Sanitary and Phytosanitary Measures, countries can no longer insist on adherence to a given set of processes or regulating measures if another country is able to demonstrate that its own measures achieve the equivalent outcomes.

In summary, the availability of highly-trained science and technology workforce is an investment incentive and provides the real base for innovation to facilitate trade and compete in the global market. It is therefore quite important that decisions are based on the most rigorous scientific analysis and risk assessment. We need to develop a society that views the scientific process as a way to develop skills in systems and objective thinking: questioning, observing, formulating and testing explanations—rather than emotively reacting to new and different ideas and developments. Thus, in a highly competitive, globalizing economy, a high-performance work environment for scientists, engineers, and technicians is more important than ever.

### **SUGGESTED AGENDA FOR ACTION**

The cumulative effects of the marginalization of science and technology in our development agenda are now being felt. However, rapid developments in the global arena of science and technology should now be accessed to provide much needed relief for some of the major problems and difficulties that beset us now.

#### **Global Scan for Advanced Technologies**

The Philippines should exert efforts to access future-oriented technological initiatives to be resilient towards achieving the goals of a newly-industrializing

nation. Every plan, program or project must have full knowledge of the options that are provided by the current and emerging developments in science and technology as inputs into a monitoring component that gives continuous feedback and guidance on real-time redirection and change in the present global context.

### **Formulate a Strategic R&D Program**

The rigorous reading of global developments will have to be translated into a research and development agenda which will gradually shift our dependence on available factor-based advantage to created technology-based advantage to address short-term as well as long-term requirements in a world economy linked through a technology-intensive international trade.

### **Organize Cross-disciplinary Teams**

This involves the purposeful coordination and integration of all experts in the different disciplines from the public and private sectors in both the planning and implementation of technological interventions. This should include facilitating collaboration with local and foreign R&D institutions.

### **Industry-Oriented Training**

Maximum emphasis shall be accorded to industry-based skills development as the ultimate resource for technology-based international market competition, keeping in mind specialization and capacity building in selected sectors for optimal use of limited resources. The Philippines urgently needs to develop a critical mass of scientists, engineers, technicians, and managers emphasizing relevance and excellence, aware of the opportunities offered by critical advances in technologies.

### **World-Class Facilities**

Several world-class laboratories and sophisticated high-throughput R&D and manufacturing facilities with up-to-date information infrastructure should be established to provide specialized capabilities, especially for small and medium local enterprises.

### **Private Sector Participation**

Our initiatives should be designed to accelerate the increasing involvement of the private sector in the science and technology enterprise. The private sector should be encouraged to achieve higher market-driven value addition through increased use of available emerging technologies to gain a competitive advantage and achieve greater global market share in knowledge-intensive economic activities.

### **Research Management**

The climate and direction for innovation culture will be set by institutions that will formulate appropriate policies, and the building of the necessary physical infrastructure that will facilitate the conduct of research and development, as well as, technology transfer activities.

## **THE IMPERATIVES OF HUMAN RESOURCE DEVELOPMENT**

It is becoming increasingly clear that in the ferocious international battle for technology's products and markets, the contributions of human capital and intellectual resources are crucial to the economic vitality of the country.

There is good evidence of the association between investment in human capital and economic growth. In a 1989 study involving 112 countries covering the years 1960–1985, Paul Romen showed that an increase in literacy rate of 10% is associated with an increase in per capita income growth rate of 0.5%. It is therefore important that there be sustained investments in human resource development at all levels. The critical skill that the functional worker must now acquire is knowledge management. According to Mr. Harreld, Senior Vice President of IBM, knowledge management is "a process that enhances the value of data or information by adding human insight and professional experiences." Knowledge management involves systems that ensure that information can be easily accessed at the moment of value and updated so that all concerned can have real-time information.

These developments point to the need for workers who are agile and sophisticated, eager to adopt a



broad range of new technologies better than the ones currently in use. This translates into training a talented, ingenious, and adaptive workforce at all levels and in all fields because change can only be properly handled by a skilled and well-trained workforce. We need to develop the attitude that working and learning are inseparable.

## **CONCLUSION**

It is urgent that we now act quickly and purposively for the Filipino people. We acknowledge that time is the least that we have, and for that reason, we must continually redirect our resources to tasks and select programs and interventions that bode the most direct impact on improving the lives of Filipinos afflicted with poverty.

The National Academy of Science and Technology Philippines commits to mentoring Filipinos who are adaptable to a broad range of new technologies. NAST PHL recognizes that in this knowledge-driven competitive environment, Filipino workers must possess the talent, skills, and willingness to learn in order to be able to make innovation a vital partner in poverty alleviation.

Above all else, NAST PHL believes that the only way we can ever cope and flourish in the face of today's challenges is by adhering to the highest standards of excellence. We need to promote the ethic of excellence, a most democratic ideal in which the only requirement is to bring out the best in all of us.