

*Keynote Speaker Article*

# Fostering Innovation and Micro, Small and Medium Enterprise Development in the Philippines through Agri-Aqua Technology Business Incubators

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## ABSTRACT

Innovation and technology are recognized as fundamental drivers of economic growth. In the Philippines, promoting innovation is seen as a key strategy to recover from the pandemic, accelerate its growth, and achieve high-income status by 2040. Universities, as sources of knowledge and centers of innovation, contribute directly to national economic development through the incubation of startup firms, commercialization, and technology transfer mechanisms. Research and development experts from these Universities generate new knowledge and commercially viable technologies that could be transferred to develop more micro, small and medium enterprises, which could significantly increase job and wealth creation. Government support mechanisms include the establishment of Technology Business Incubators (TBIs) to bridge the gap between knowledge creation and markets. TBIs actively support the process of the creation of startups or new companies through technology transfer. This presentation describes the relevance and engagement of university-led TBIs in the Philippines. Agri-Aqua TBIs funded by the Department of Science and Technology are potentially tapped as engines and accelerators of commercialization of research outcomes of selected State Universities in the Philippines. It is recommended that innovative technologies in the agriculture and aquaculture sector be strengthened and sustainably developed to achieve the long-term goals of innovation, technological advancement and sustainable growth of the country.

## KEYWORDS

enterprise development; innovation; startup; technology business incubators; technology transfer

## 1. INTRODUCTION

The advancement of any economy relies significantly on the introduction of novel ideas, and this principle is applicable to the Philippines (Bansal et al., 2022). Economic growth in the country heavily depends on the agricultural and aquaculture sectors, and the integration of inventive solutions within these areas can contribute to heightened productivity, efficiency, and sustainability (Boyd et al., 2020). It is imperative to adopt progressive strategies in agriculture and aquaculture to ensure the comprehensive advancement of the nation's economic landscape (Gephart et al., 2021).

The Philippine economy is significantly influenced by micro, small, and medium enterprises (MSMEs), particularly in the agricultural and aquaculture sectors, where they frequently spearhead innovative initiatives (Setiawan et al., 2023). Despite being catalysts for innovation, MSMEs often grapple with constraints, such as limited resources and expertise, hindering their ability to cultivate and bring innovative technologies to the commercial forefront effectively (Gamage et al., 2020). The challenges faced by MSMEs underscore the importance of targeted support mechanisms to empower them in navigating the complexities of technological development and commercialization processes, ensuring their continued vital role in fostering innovation and economic growth (Cueto et al., 2022).

To tackle the challenges faced by micro, small, and medium enterprises (MSMEs) in the agricultural and aquaculture sectors, the implementation of agri-aqua technology business incubators (ATBIs) emerges as a promising solution (Bank, 2023). These incubators play a pivotal role in providing MSMEs with the essential resources and support required for the development and commercialization of innovative technologies (Adeosun & Shittu, 2022). ATBIs offer a comprehensive range of services encompassing technology management, assisting MSMEs in identifying, developing, and safeguarding their intellectual property (Ali et al., 2023). Furthermore, they contribute to business development by aiding MSMEs in crafting business plans, marketing their products, and facilitating access to financing (Prakash et al., 2021). The networking aspect of ATBIs is equally crucial, fostering connections between MSMEs and a broader ecosystem of entrepreneurs, investors, and industry collaborators (Majid & Maulana, 2023). Demonstrating effectiveness, ATBIs have played a significant role in the Philippines, contributing to the establishment of new businesses, job creation, and heightened productivity within the agricultural and aquaculture sectors (Schoor et al., 2023).

The initial objective of this composition is to elucidate the Status of Innovation in the Philippines. In delving into this, the focus will be on providing a comprehensive description of the current state of innovation within the country, taking into account various sectors and industries. The second aim is to expound on the Role of Innovation in the Philippine Economy, examining how innovative practices contribute to economic growth, sustainability, and competitiveness on a national and global scale. The third objective entails elucidating the correlation between Science and Technology and the development of MSMEs, thereby examining the reciprocal connection existing among technological advancements, scientific advancements, and the prosperous growth of MSMEs. The fourth objective is to outline the significance of Agri-Aqua Technology Business Incubators (ATBI) and Innovation System Enhancement, delineating how these entities play a crucial role in fostering innovation and propelling the development of the entrepreneurial ecosystem.

The novelty of this work lies in its comprehensive exploration of various dimensions of innovation in the Philippines, providing a nuanced perspective that surpasses traditional narratives. By addressing diverse objectives, the composition aims to present a holistic view of innovation dynamics, distinguishing itself through nuanced analysis and synthesis. The

benefits are manifold, serving as a valuable resource for policymakers and researchers offering insights into the crucial role of innovation in economic development. Furthermore, the exploration of Science and Technology and MSME development provides actionable information, guiding strategic planning. Lastly, the examination of ATBI and Innovation System Enhancement offers practical approaches for supporting innovation and entrepreneurial endeavors. In essence, the composition contributes substantively to the discourse on Philippine innovation, providing practical insights for stakeholders to foster positive development.

## 2. METHODOLOGY

The chosen research methodology for this study is the descriptive method, a systematic approach intended to provide a thorough and factual depiction of an existing situation, phenomenon, or symptom (Cuthbertson et al., 2020). In the context of this research, the descriptive method proves to be apt as it seeks to unravel and delineate the integral role of Agri-Aqua Technology Business Incubators (ATBIs) in fostering innovation and facilitating the development of Micro, Small, and Medium Enterprises (MSMEs) within the realms of agriculture and aquaculture in the Philippines (Alexandropoulos et al., 2023). By opting for this method, the research endeavors to offer a comprehensive understanding of the intricate dynamics at play, embracing a detailed exploration that goes beyond mere statistical analysis (Skivington et al., 2021). This approach allows for a nuanced portrayal of the current state of ATBIs, elucidating their impact on innovation within the MSME sector. Consequently, the descriptive method becomes an invaluable tool in unraveling the complexities inherent in the intersection of technology incubation, entrepreneurial development, and the specific contexts of agriculture and aquaculture (Irawan, 2023) in the Philippines, contributing to a more holistic comprehension of the subject matter (Yan et al., 2023).

## 3. RESULTS AND DISCUSSION

### 3.1. Current State of Innovation in the Philippines

The Global Innovation Index (GII) stands as a benchmark for evaluating world economies based on their innovative capabilities, encompassing both input and output parameters (Erdin & Çağlar, 2023). The Philippines' standing in the GII has demonstrated fluctuations over the years, reflecting variations in its ranking and areas of strength and enhancement (Goltiano et al., 2021). In the 2022 ranking, the country experienced a decline to the 59th position, a downturn from its 2021 standing (Dutta et al., 2022). This dip was predominantly attributed to reduced performance scores in Knowledge and Technology Outputs, primarily influenced by factors such as knowledge creation, impact, and diffusion (Chawla & Kumar, 2023).

However, there was a positive shift in the 2023 ranking, as the Philippines secured the 56th position among 132 economies, showcasing improvement from the preceding year (Rajabov et al., 2023). Notably, the country exceeded expectations relative to its gross domestic product (GDP), indicating a capacity to generate more innovation outputs in proportion to its level of innovation investments (Sharif et al., 2023). The rankings from previous years also underscore the dynamic nature of the Philippines' performance in the GII, ranging from the 51st to the 73rd position in different periods (Serzo, 2021).

Examining specific areas of strength and improvement, the Philippines demonstrates prowess in Business Sophistication, Knowledge and Technology Outputs, and Market

Sophistication. However, there is room for enhancement in crucial domains such as Human Capital and Research, Infrastructure, and Institutions (Ammirato et al., 2023). This nuanced evaluation of the GII reveals a comprehensive landscape, showcasing the country's innovation strengths while highlighting targeted areas for development (Strielkowski et al., 2023).

Ultimately, the GII serves as a valuable tool offering insights into the innovation performance of economies, aiding them in making informed policy decisions (Tziogkidis et al., 2020). For the Philippines, its GII performance serves as a testament to the nation's commitment and advancements in the realm of innovation (Maruccia et al., 2020). The nuanced understanding of areas of strength and opportunities for improvement provides a strategic roadmap for further development, ensuring the country remains on a trajectory of sustained progress in the field of innovation (Tziogkidis et al., 2020).

### 3.2. Role of Innovation in the Philippines Economy

The pivotal role of innovation in steering economic growth, sustainability, and competitiveness stands as a cornerstone in the Philippines' economic landscape (Escollano et al., 2023). In the ensuing discussion, the third objective aims to elucidate the intersection of science and technology with the development of MSMEs. This objective involves an examination of the symbiotic relationship between technological advancements, scientific progress, and the prosperity of micro, small, and medium enterprises (Chege & Wang, 2020). In terms of economic growth, innovation serves as a catalyst that not only enhances the quality of goods and services but also streamlines production processes, benefiting consumers, businesses, and the overall economy (Surya et al., 2021). The consistent demonstration of technological innovation as a driver of sustainable economic growth underscores its indispensable role in shaping the economic trajectory, assuming continuous returns to innovative research (Omri, 2020).

Sustainability is another dimension where the Philippines has strategically acknowledged and leveraged innovation (Mady et al., 2023) in the pursuit of unlocking the potential inherent in distinctive sources of innovation within the country, such as traditional knowledge and cultural expressions. The nation endeavors to embrace these resources while simultaneously implementing safeguards against misappropriation (Sian & Smyth, 2022). The emergence of social entrepreneurship further contributes to the nexus of economic growth and sustainability, emphasizing initiatives that benefit public welfare (Ullah et al., 2022).

Moreover, the influence of innovation reaches into the realms of education and social development, exemplified through academic initiatives that strive to cultivate individuals capable of making significant contributions to the global knowledge economy and addressing socio-economic challenges at the national level (Corso, 2020). The interconnectedness of innovation, competition-driven growth, and enhanced productivity highlights their pivotal roles in promoting inclusive growth, not only within the national landscape but also on the global stage (Ullah et al., 2022). This symbiotic relationship underscores the multifaceted impact of innovation, stretching beyond economic realms to encompass broader aspects of societal progress and development (Vincent & Feola, 2020).

### 3.3. The Philippine National Innovation Strategy

Filipinnovation, encapsulated in the Philippine National Innovation Strategy, aspires to harness the inventive spirit of Filipinos to bolster global competitiveness (la Peña, 2020). The strategy revolves around the "Four Pillars" approach, each delineating a distinct facet to

shape the landscape of innovation within the country (Macaranas, 2023). The first pillar emphasizes the critical need to fortify Filipino human capital, aiming to cultivate a skilled workforce proficient in science, technology, and entrepreneurship to serve as the bedrock for sustained innovation (Gonzales et al., 2022). Simultaneously, the second pillar focuses on supporting business incubation and acceleration efforts, recognizing the role of entrepreneurship in translating innovative ideas into thriving ventures (Pustovrh et al., 2020).

The third pillar of Filipinnovation revolves around reshaping the policy environment to foster innovation (Dutta et al., 2020). The strategy aims to regenerate policies that acknowledge the importance of adaptive regulations by eliminating barriers and providing incentives conducive to innovative endeavors (Srisathan et al., 2023). By creating an environment that supports and encourages innovation, Filipinnovation aims to facilitate unimpeded growth in innovative enterprises (Garcia et al., 2021). Lastly, the fourth pillar is dedicated to engendering a mindset and culture of innovation (Canning et al., 2020). Filipinnovation recognizes that innovation goes beyond infrastructure or policies (Jugend et al., 2020), emphasizing the need to instill a societal ethos that values creativity (Alacovska & Kärreman, 2023), resilience, and an entrepreneurial spirit (Cueto et al., 2022).

In conclusion, Filipinnovation's holistic approach, rooted in the Four Pillars, seeks to usher in a new era of creativity and competitiveness in the Philippines (Saqib & Satar, 2021). By fortifying human capital, supporting entrepreneurial ventures, reshaping policies, and fostering a culture of innovation, the strategy aspires to position the nation as a formidable force in the global innovation landscape (Fasi, 2023). Through these concerted efforts, Filipinnovation endeavors to propel the Philippines towards sustained progress and success on the world stage.

### **3.4. Illuminating the Synergy: Science, Technology, and MSMEs Development**

The effort acknowledges the crucial function of MSMEs as sources of innovation, even though they operate with limited research and development (R&D) budgets (Khurana et al., 2021). This recognition is emphasized by the noteworthy impact of MSMEs on the Global Innovation Index (GII) of the country, resulting in an improvement in the Philippines' ranking from 73rd to 54th among 129 nations (la Peña, 2020). The substantial influence of the MSME sector on overall innovation persists, highlighting the essential contribution of these businesses in propelling innovation and enhancing competitiveness in the Philippines (ESCAP, 2021).

The initiative underscores the impact of digitalization on innovation and competitiveness, emphasizing the integration of technological advancements into MSME developmental strategies in the Philippines (Supriyati et al., 2023). Collaborations with higher education and government programs, notably the STRIDE initiative supported by USAID, play a crucial role. STRIDE focuses on strengthening higher education, government initiatives, and the regulatory framework, enhancing research productivity, fostering collaboration, and cultivating a robust innovation ecosystem (Crocco, 2021). This strategic approach contributes significantly to economic development, aligning with the nation's rapid economic growth.

In summation, "Illuminating the Synergy: Science, Technology, and MSMEs Development in the Philippines" articulates a nuanced understanding of the interconnected dynamics between science, technology, and MSME development as a catalyst for innovation and economic expansion (Ilas-Panganiban & Mitra-Ventanilla, 2020). The initiative's acknowledgment of MSMEs as pivotal contributors to the innovation landscape highlights their central role. Additionally, its focus on the transformative effects of digitalization

underscores the importance of embracing technological advancements (Volberda et al., 2021). Furthermore, strategic collaborations with educational institutions and government programs play a crucial part in fostering a dynamic and prosperous innovation ecosystem in the Philippines (Lunag et al., 2023).

### **3.5. Agri-Aqua Technology Business Incubators (ATBI) and Innovation System Enhancement: Driving Innovation and Entrepreneurial Ecosystem Development**

Agri-Aqua Technology Business Incubators (ATBIs) are positioned as pivotal entities in fostering innovation within the Philippine agricultural and aquaculture sectors (Bank, 2023). Through their provision of essential resources and support, ATBIs facilitate the development and commercialization of innovative technologies, contributing to transformative advancements in these sectors (Orozco & Grundmann, 2022). One of the primary impacts of ATBIs lies in their ability to enhance productivity and efficiency for Micro, Small, and Medium Enterprises (MSMEs) (Phuong et al., 2021). By guiding MSMEs in the adoption of novel technologies, ATBIs pave the way for streamlined processes, ultimately improving the overall productivity and efficiency of operations in agriculture and aquaculture (Mustafa et al., 2021).

Furthermore, ATBIs play a crucial role in bolstering the competitiveness of MSMEs operating in these sectors. The support offered by ATBIs extends to the development of new and innovative products and services, empowering MSMEs to navigate the challenges of the global market (Ilas-Panganiban & Mitra-Ventanilla, 2020). This strategic guidance enables MSMEs to position themselves as contenders in the global landscape, fostering a competitive edge that is essential for sustainable growth and market resilience (Cueto et al., 2022).

In addition to improving productivity and competitiveness, ATBIs contribute significantly to meeting the evolving needs of consumers (Olazo, 2023). By assisting MSMEs in the development of innovative products and services, ATBIs align local enterprises with the changing preferences and demands of consumers (Taneja et al., 2023). This adaptive approach not only ensures the relevance of agricultural and aquaculture products in the market but also positions MSMEs to be responsive to consumer trends, thereby enhancing market penetration and consumer satisfaction (Suson et al., 2023).

### **3.6. Universities as Center of Innovation**

The pivotal role of universities as epicenters of innovation in the Philippines is instrumental in steering the nation's economic growth and cultivating a thriving innovation ecosystem (Nguyen et al., 2020). Strategic collaborations with higher education institutions and government programs have proven crucial in amplifying the impact of science and technology on the Philippine economy (Moreno & Sulasula, 2023). Notably, the Science, Technology, Research and Innovation for Development (STRIDE) program, supported by the US Agency for International Development (USAID), stands out as a noteworthy initiative (Weidner et al., 2023). Aimed at fortifying higher education institutions, government programs, and the regulatory framework, STRIDE employs a multi-sectoral approach, providing targeted technical assistance to enhance research productivity in Philippine universities and catalyze collaboration among diverse stakeholders (Murphy et al., 2022). This comprehensive strategy contributes to the cultivation of a robust innovation ecosystem that, in turn, propels economic development in the country (Madsen, 2020).

Moreover, universities in the Philippines have received financial support for the establishment of incubation centers, signaling a dedication to fostering innovation and entrepreneurship within the academic realm (Parthasarathy et al., 2021). The burgeoning landscape includes over 20 incubation centers, 30 investors, and 20 venture capitalists, supporting a network of more than 300 startups, with 200 actively operating as of July 2018 (Alinsunod et al., 2019). This flourishing ecosystem illustrates the pivotal role of higher education in not only nurturing a culture of innovation but also actively supporting the growth of entrepreneurial ventures (Pustovrh et al., 2020).

In essence, universities in the Philippines stand as vital hubs for innovation, research, and entrepreneurship, exerting a crucial influence on the advancement of science, technology, and the development of Micro, Small, and Medium Enterprises (MSMEs) (Mendoza, 2023). Beyond serving as knowledge repositories, these institutions actively contribute to the country's economic growth and innovation by providing a fertile ground for research endeavors, fostering collaborative initiatives, and nurturing the development of innovative solutions to address both societal and economic challenges (Leckel et al., 2020). Innovation ecosystems refer to the collaborative network involving various stakeholders, such as academic institutions, enterprises, and governmental bodies, collectively contributing to the advancement of innovation and economic progress (Carl, 2020). Universities are pivotal in fostering innovation by cultivating an environment for research, creativity, and expertise (Vicente-Saez et al., 2020).

#### 4. CONCLUSION

This research aimed to unravel the pivotal role of universities in the Philippines as catalysts for innovation, with a particular emphasis on collaborative initiatives with government programs such as the Science, Technology, Research and Innovation for Development (STRIDE) program. The research objectives have been successfully addressed, revealing that universities play a crucial role in fostering innovation, research, and entrepreneurship, significantly impacting the nation's economic growth. The findings underscore the substantial influence of universities in driving economic growth through collaborative partnerships. The USAID-supported STRIDE program serves as a pertinent example, fortifying research productivity, fostering a multi-sectoral collaboration, and contributing to a robust innovation ecosystem. The interconnectedness between academia, government programs, and external agencies showcases the multifaceted role of universities in shaping the innovation landscape. To further amplify the positive impact of universities on innovation and economic growth, it is suggested that continuous efforts be made to enhance collaborative initiatives. Strengthening partnerships between higher education institutions, government programs, and external agencies will create a conducive environment for sustained innovation. Encouraging universities to participate actively in similar collaborative programs will contribute to the ongoing development of the innovation ecosystem. This research recommends an intensification of collaborative initiatives, emphasizing the sustained engagement of universities in fostering innovation and entrepreneurship. Strategic partnerships, similar to the successful model exemplified by the STRIDE program, should be actively promoted. Additionally, encouraging universities to establish and expand incubation centers would further nurture a culture of innovation and support entrepreneurial ventures. The research highlights the need for policies that promote and incentivize collaborative initiatives between universities and government programs. Policymakers should strategize for sustained university partnerships to drive economic growth through innovation-led development. Creating an environment conducive to these collaborations will contribute significantly to the long-term success of innovation ecosystems in the Philippines.

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