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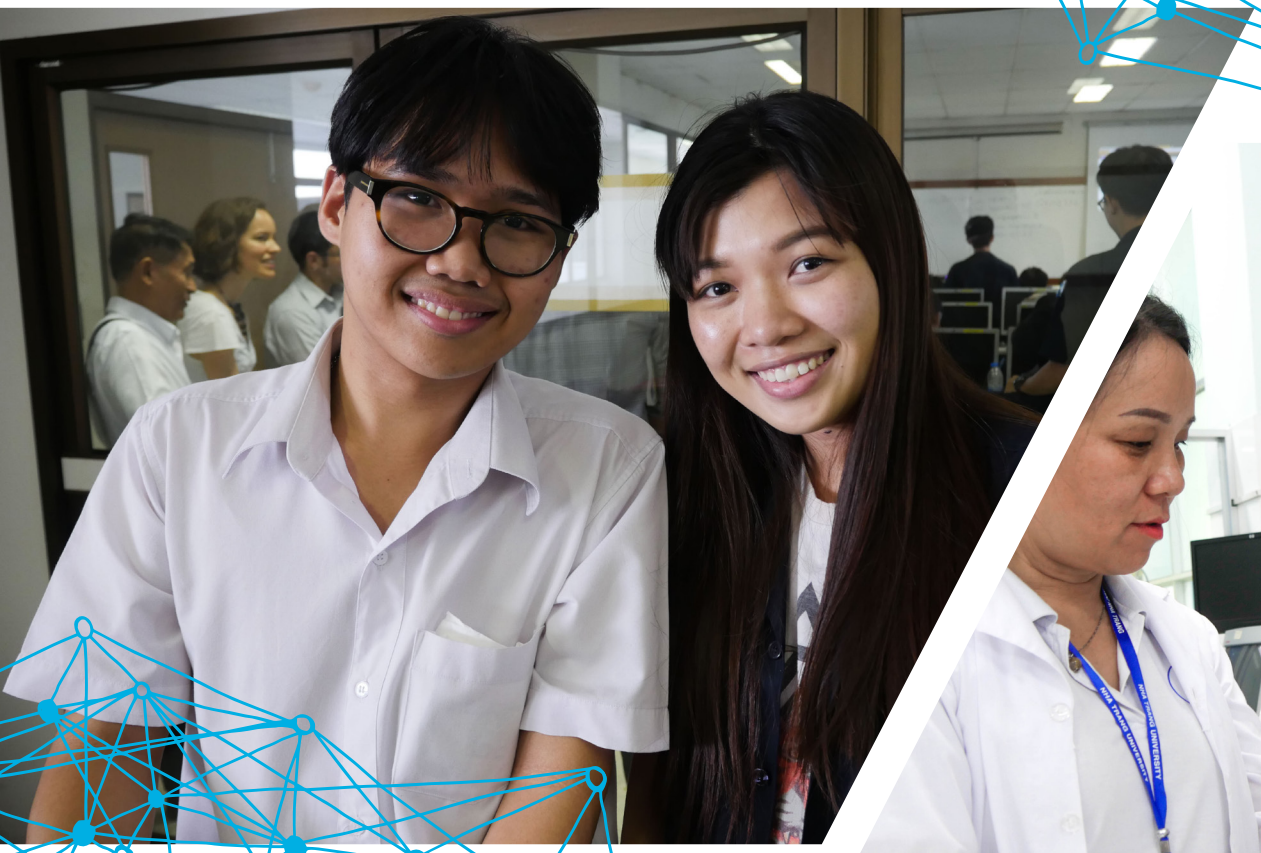

BUILDING HIGHER EDUCATION FOR GROWTH AND INNOVATION IN THE ASIA-PACIFIC REGION:

Analysis & Best Practices from the Philippines and Vietnam

USAID FROM THE AMERICAN PEOPLE

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I. INTRODUCTION & PURPOSE

Across the Asia-Pacific region, emerging middle-income countries are focusing on the need to produce the agile, technically-skilled workforce required to achieve inclusive economic growth—whether through industrialization or transition to an innovation-led economy.

Graduates need up-to-date skills that align with the current needs of private-sector employers and the tools to become innovators and lifelong learners in a rapidly evolving technological future.

To meet these challenges, numerous emerging economies are working with assistance from the U.S. Agency for International Development (USAID) to transform their higher education institutions into enablers of economic growth—harnessing university research and innovation for economic upgrading and improving the technical and cross-cutting capabilities of the future workforce. They are doing so by improving curricula, teaching methods, and degree offerings; making learning more hands-on, project-based, and experiential; reshaping relationships with employers and industry partners to be more collaborative and flexible; and drawing on lessons of self-government and peer accountability in American higher education.

This research brief profiles the USAID/Philippines Science, Technology, Research, and Innovation for Philippine Development (STRIDE) program and a series of three activities in Vietnam that started with the Higher Engineering Education Alliance Program (HEEAP) and are collectively referred to as HEEAP 1.0–3.0. STRIDE and HEEAP represent two very different modes of USAID engagement in higher education, with substantially different goals. STRIDE is a cooperative agreement issued to an implementing partner in support of USAID's Partnership for Growth under a U.S.-Philippines bilateral agreement. Its purpose is to increase university research and innovation capacity in collaboration with industry. The HEEAP projects are a series of USAID Global Development Alliances initiated by a pre-existing industry-university partnership. They focus explicitly on improving the quality of the engineering workforce, rather than university research capacity.

Both STRIDE and HEEAP, however, represent distinctly American approaches to higher education. They emphasize demand-driven partnerships between higher education and industry; the self-organization of university-industry alliances based on mutual benefit; and the role of independent accreditation entities and professional organizations in higher education. These models offer tested pathways to improve the performance of local higher education systems and the capacity of government, the private sector, and civil society to work together to solve development problems—pathways that USAID prioritizes in *the journey to self-reliance*. They also represent clear alternatives to more centrally-planned development approaches.

II. METHODOLOGY AND STRUCTURE

This brief was prepared by reviewing all available documents and available external evaluations from STRIDE and HEEAP. Secondary research was complemented by 17 in-depth interviews with USAID missions and stakeholders, including university administrators, faculty members, and representatives of the' private sector partners.

After a brief introduction to the programs, the remainder of this brief provides information in comparative form, structured around themes that are of critical importance to higher education program design. For each program, the brief outlines:

- The economic and higher education development needs that were addressed
- How STRIDE and HEEAP were initiated, with specific attention to USAID priorities
- Program and activity objectives
- The overall technical approach and notable (innovative) interventions
- Partnerships with (1) local universities, (2) private sector, (3) U.S. universities, and 4) host country governments, including local governance arrangements, with a focus on the challenges and lessons learned in each
- How gender equity and social inclusion goals were addressed
- How the system-level transformation to support local higher education systems' progress towards self-reliance was promoted

III. OVERVIEW OF THE PROGRAMS

The USAID/Philippines Science, Technology, Research, and Innovation for Philippine Development (STRIDE) program is a five-year, $32 million cooperative agreement initiated by USAID as one of the largest investments of the United States Government (USG) in the Partnership for Growth, a high-level initiative focused on countries committed to good governance and aimed at stimulating inclusive economic expansion in the Philippines. STRIDE was awarded in July of 2013 to RTI International and a consortium comprised of Rutgers University, Florida State University (FSU), University of Michigan William Davidson Institute (U of M), and local resource partner Philippine Business for Education (PBEd). In 2018, USAID granted a three-year, $4.9 million cost extension permitting STRIDE to continue targeted technical assistance to Government of the Philippines (GPH) partners.

The overall objective of STRIDE is to strengthen the science, technology, research, and innovation capacity in Philippine higher education with a focus on disciplines that contribute to high-growth economic sectors. STRIDE was designed to be geographically inclusive—building the scientific, institutional, and systemic capacity for industry-relevant applied research to support diverse industries nationwide, driving inclusive growth. To overcome deficiencies in the enabling environment for industry-academic-government collaborations, STRIDE adopted the guiding principle of "Make Friends, Build Trust," creating opportunities and structures for industry to collaborate with universities to solve real technical problems while building research capabilities and strengthening institutions. This model of decentralized, voluntary, and market-led collaboration represents a clear alternative to centrally-directed research or industrial policy programs.

Vietnam's Higher Engineering Alliance Program (HEEAP) refers to a series of Global Development Alliances initiated by the Intel Corporation with Arizona State University (ASU) as the lead implementing partner and supported by USAID and in-kind support from a number of private sector partners. Throughout this brief, we refer to the entire series of activities collectively as "the HEEAP Alliance." This term encompasses elements supported by USAID and those in which USAID does not participate. The original HEEAP (1.0) activity ran from 2010–2013 with financial assistance from Intel ($2.6 million), USAID ($2 million), and ASU ($322,000) and in-kind contributions from Siemens, Danaher Corporation, and Cadence Design Systems. The Vocational and University Leadership Innovation Institute (VULII, or HEEAP 2.0) ran from 2013–2016 (extended from 2015) with financial support from Intel ($276,000)[1] and USAID ($2.5 million) and additional in-kind contributions from Microsoft, Pearson, eSilicon, Pearson, and Viettel. While the HEEAP Alliance continues, USAID is currently engaged only through the Building University-Industry Learning and Development through Innovation and Technology cooperative agreement (or BUILD-IT, sometimes called HEEAP 3.0 by external partners), which runs from 2015–2020. USAID is the primary donor, contributing $5.7 million, along with Amazon Web Services, Autodesk, Dow Chemical, eSilicon, Intel, John Wiley & Sons, Meetech, Microsoft, Mobifone, National Instruments, Oracle, Pearson Education, Saigon Hi-Tech Park, Sen Group, Siemens, Tektronix, and Viettel providing limited cash and extensive in-kind contributions.

These activities are intended to transform engineering education in Vietnam, building the institutions and models of industry–academic collaboration to produce a technology workforce with the technical and soft skills required by industry to enable success in technology-intensive global manufacturing. By defining international accreditation as a key indicator of success, the activities also advance a self-organized, peer-to-peer accreditation model as a clear alternative to exclusive central government control over higher education and quality assurance.

IV. WHAT NEEDS WERE THE PROGRAMS DESIGNED TO ADDRESS?

STRIDE and HEEAP address the distinct challenges of two rapidly growing Southeast Asian economies at different phases of their economic development.

STRIDE addresses the need for greater university innovation capacity to support the Philippines' transition to an innovation-led economy. Despite extremely rapid economic growth throughout the late 2000s and early 2010s, the Philippines continued to under-perform regional peers in global indices of science, technology, and innovation (STI), hampering the country's transition to a more innovation-driven economy. At the outset of the program, the Philippines higher education sector faced multiple challenges to advancing STI, including shortages of qualified faculty, poor research capacity, and weak industry-academic linkages. The widespread absence of exposure among faculty to current industry practices also reduced the quality and relevance of university-level instruction, resulting in less-well-prepared graduates who might otherwise contribute to upgrading the Philippine economy. These challenges were compounded by weak inter-departmental coordination between government agencies responsible for research and industry development; low levels of trust among industry, academia, and government; and university and government practices and policies that unintentionally discouraged faculty from undertaking research. As a result, GPH sought to achieve a higher level of productivity, international competitiveness, industry relevance, and social responsiveness in the development of both mid-level skills and the high-level professions. STRIDE was designed to support this goal by working selectively with top U.S. and local universities and a broad swath of local industry to transmit the

1 Intel's total contribution to HEEAP 2.0/VULII amounted to approximately $7 million, $276,000 of which was provided via the USAID agreement and the remainder directly to ASU (outside of the USAID agreement) as part of the broader HEEAP Alliance.

best aspects of the American university-industry partnership model—in which close collaboration between academic research and industry is the norm.

The HEEAP Alliance addresses the need for a skilled engineering workforce to support Vietnam's transition from an agricultural economy to a private sector-led manufacturing-driven economy. Vietnam is a lower-middle income country with a GNI per capita of $2,060 and is in the early stages of industrialization. Until recently, Vietnam was an agricultural economy with a higher education system catering to only a small percentage of the population. As Vietnam has worked to leverage the advantages of an abundance of low-cost labor and grow towards an "efficiency-driven" stage of economic development[2], the Science, Technology, Engineering, and Mathematics (STEM) education system has required significant upgrading.

The country has recently experienced rapid growth, as manufacturing and technical jobs have flowed in from China and the West. Vietnam's GNI has grown by more than 5 percent in all but two years since 1991, with a 2016 growth rate of 7.3 percent. Despite rapid increases in foreign investment, Vietnam has struggled to accelerate growth in labor productivity and lags behind much of the Asia-Pacific Region (Vietnam Investment Review, 2017). Vietnam ranks 55th in economic competitiveness; it has improved 13 spots in the past decade but ranks 84th in higher education. An "inadequately educated workforce" is noted as the second biggest inhibitor to doing business in Vietnam, with the country ranking 85th in math and science education (WEF, 2018). ASU estimates that Vietnam's employers face a shortage of several hundred thousand engineers; approximately 30,000 engineers graduate annually from university.

The HEEAP Alliance sought to pave the way for broader changes in the Vietnamese Ministry of Education and Training (MOET) and Ministry of Labor, Invalids, and Social Affairs (MOLISA) by first building the skills of university engineering professors, building leadership capacity through VULII, and eventually building broader institutional and curriculum improvements aligned with international accreditation standards in BUILD-IT.

V. HOW THE PROGRAMS WERE INITIATED AND USAID PRIORITIES SUPPORTED

STRIDE was initiated under a bilateral agreement between the governments of the U.S. and the Philippines. STRIDE supports the 2011 Partnership for Growth (Partnership for Growth with Equity as of 2017). One objective of the PFG Country Plan for 2012–2016 was to "enhance human capacity for economic growth" by strengthening linkages between academia and industry and improving the capacity of local universities to carry out innovative science and technology research in high-value economic sectors. STRIDE also supported the USAID/Philippines Cities Development Initiative (CDI), which aimed to build capacity for development in dynamic secondary cities across the Philippines and to make growth more inclusive and broader based.

The HEEAP Alliance was initiated by the Intel Corporation with Arizona State University, later supported by USAID. The story of the HEEAP Alliance began in 2005 with the decision by Intel to build its largest semiconductor assembly and test plant in Vietnam. This facility demanded a highly-skilled engineering labor force, which Intel struggled to find. As a result, from 2005–2008, Intel sent about two dozen Vietnamese engineers to study at Portland State University (PSU) and work at Intel in Portland. Intel realized, however, that this high-cost, low-scale model was not sustainable. Thus, in 2008, Intel selected a proposal from ASU to transform engineering education in Vietnam and committed initial funding. Together they began talks with USAID/Vietnam around shared interests in building the Vietnamese technical workforce. In 2010 the three parties signed a Global Development Alliance (GDA) initially focused on improving engineering

2 Efficiency-driven stages of development are focused on achieving scale and efficiency in capital-intensive manufacturing activities. It is the second of three phases in a typology of economic development first proposed by Professor Michael Porter of Harvard Business School and used by the World Economic Forum to describe country economic conditions.

pedagogy in Vietnamese universities (HEEAP 1.0). By developing innovative partnerships for higher education development, the HEEAP Alliance supports the USAID/Vietnam Country Development Cooperation Strategy (CDCS) Objective 1.3, Innovation Stimulated through Public-Private Alliances, under the broader objective of Enhanced Governance for Broader, Sustainable Growth. Currently, USAID supports the Alliance only through the BUILD-IT cooperative agreement mechanism, while ASU and partners continue some activities under the HEEAP brand.

VI. PROGRAM OBJECTIVES

STRIDE's overall program objective is strengthened *science, technology, and innovation capacity of higher education institutions in the Philippines* and is supported by four intermediate results combined into three program "missions." Mission 1 addresses STI capacity, encompassing improved qualifications of faculty and staff in higher education institutions engaged in relevant STI disciplines and improved research capacity in critical science, technology, and innovation (STI) disciplines.[3] Mission 2 focuses on strengthened linkages between academe and industry in high growth sectors. Mission 3 strives for strengthened policy and management capacity among higher education institutions in improving the STI ecosystem. Annex 1 shows the entire framework with key activities. The successful performance of each mission rests on the informally-adopted guiding principle, "Make Friends, Build Trust." Building social capital and a better environment for collaboration was identified (through the program's Innovation Ecosystem Assessment) as a precondition not only of IR 3, but for the supportive institutional environment needed to develop an economically-relevant research enterprise in the Philippines.

The HEEAP Alliance's overall objective is to embed global engineering education standards in Vietnamese higher engineering education through modern engineering pedagogy, institutional governance, quality assurance, and access to technology. Intel considered accreditation from the Accreditation Board for Engineering and Technology (ABET) to be "a critical success priority from the outset and the indicator of transformation." It would demonstrate that universities are both capable of producing world-class engineering graduates and are committed to sustaining institutional improvement through the ongoing accreditation process. This emphasis is consistent with USAID's road to sustainability and resilience, supporting the Government of Vietnam's (GVN's) transition towards an expanded role for the private sector in leading the country's economic and workforce development.

Each phase of the HEEAP Alliance adopted stage-appropriate objectives. HEEAP 1.0 aimed to transform Vietnam's engineering pedagogy from "passive, theory-based, to active, project-based instruction" in order to produce "work-ready" graduates. HEEAP 2.0/VULII aimed to build institutional leadership commitment and capacity for achieving higher standards in Vietnamese universities and technical colleges. Finally, BUILD-IT aims to mainstream alignment of university curricula, quality assurance, and facilities in supported institutions with ABET requirements.

3 Mission 1 combines IRs 1 & 2 in the project's official results framework.

VII. TECHNICAL APPROACH AND INNOVATIVE INTERVENTIONS

STRIDE's three operational "missions" are designed to promote the self-reliance and resilience of the Philippine STI ecosystem by improving the relationships that drive more robust R&D and innovation partnerships between universities and industry and by supporting the government financial and administrative structures that enable these relationships. STRIDE sought to make three sets of relationships self-perpetuating: between researchers in universities and industries engaged in productive research collaborations; between university administrators and industry decision-makers who support and fund ongoing research collaborations; and between Filipino and U.S. researchers and university departments through which knowledge pipelines between Philippine and U.S. labs and departments are constructed. This approach is illustrated in Figure 1. As such, STRIDE envisioned a future in which an increasing proportion of research funding is provided by private sector sources, and GPH research funding is aligned more directly with industry needs. This emphasis on industry-relevant applied research stands in contrast to research-focused initiatives that principally aim to increase the scientific stature of higher education through publications—but do not necessarily improve relationships between actors to the benefit of the economy.

Figure 1: STRIDE Technical Approach

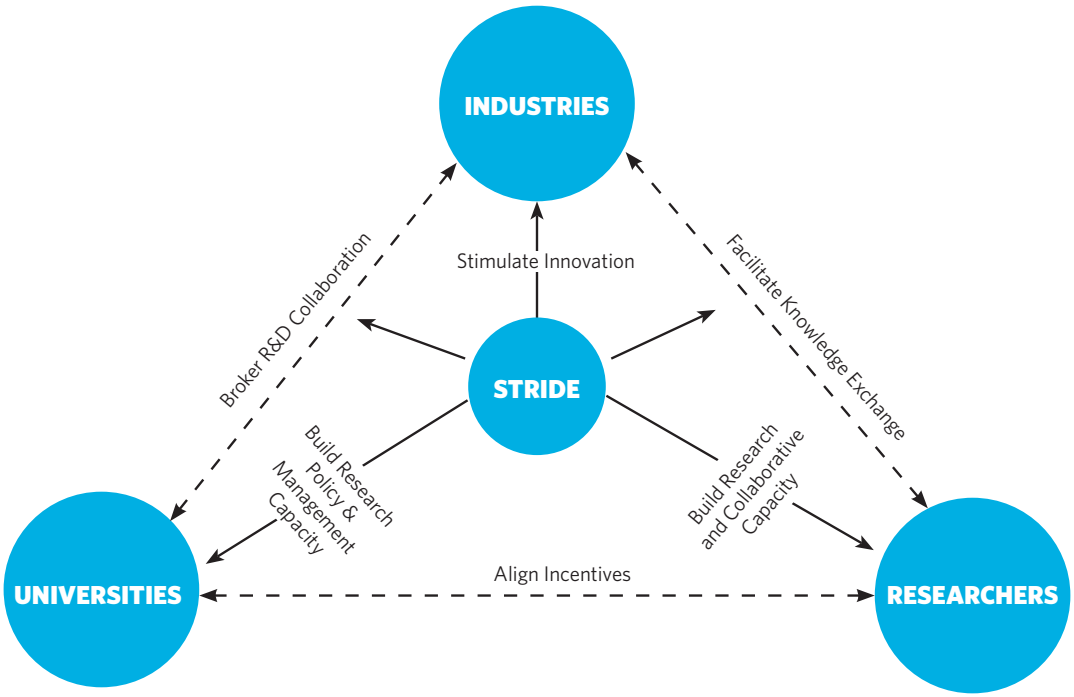


Table 1: STRIDE Key Interventions

MISSION 1- INDUSTRY/PRIVATE SECTOR ENGAGEMENT (IR'S 1-2)	MISSION 2- STI CAPACITY-DEVELOPMENT (IR 3)	MISSION 3- UNIVERSITY POLICY AND MANAGEMENT (IR 4)
Innovation Workshops focused on resolving industry technical issues*	Collaborative Applied Research with Industry (CARWIN) grants to Philippine universities with Philippine industry partner for specific technical issues*	National Innovation Ecosystem Assessment and Participatory Diagnostics of Philippine Universities*
Establish University Career Centers*	Philippine-U.S. Research and Exchange (PURE) grants to Philippine universities with U.S. university partner for joint applied research relevant to Philippine industry*	National University Technology Management Conference(s)
University guest lecturers by industry speakers	Academic grants for Industry-Led Applications (AGILA) jointly funded (1:1) with industry*	Assist with national policy improvement(s) and promote U.S. models, intra-GPH collaboration*
Establish Knowledge and Technology Transfer Offices (KTTOs)*	Advanced (PhD) research scholarships in the U.S. (sandwich)* and in-country research training for S&T faculty (START)	Develop business plans for industry labs/shared services/innovation hubs
Faculty externships in Philippine industry*	Visiting U.S. professors in Philippine universities	
Case Writing Workshops to support case-based teaching	STRIDE Innovation for Development (SID) grant to support applied research on solutions to poverty*	
	STRIDE Prototype Research and Innovation Grant [SPRIG] to universities to develop prototypes for commercialization (after CARWIN research)	
	Professional Science Master (PSM) scholarships for study in the U.S.*	
	PSM Curriculum Development for Philippine Universities*	
	Establish *International Journal of Philippine Science and Technology* (online)	

**Denotes new/novel/innovative intervention approach*

STRIDE's most innovative interventions were:

- **Use of Innovation Workshops as a door-opener:** These were an effective and relatively informal mechanism to catalyze applied university-industry collaboration around specific areas of interest with low initial commitment but with follow-on research grants as an incentive to future collaboration. This was an essential starting point in the low-trust environment.

- **Establishing Knowledge and Technology Transfer Offices (KTTOs) and Career Centers** as effective mechanisms to institutionalize ongoing dialogue and ***build habits of collaboration*** between universities and employers/industry. **KTTOs** signified a shift of mission from a narrow focus on intellectual property commercialization to a one-stop shop for industry relationships. Establishing **Career Center**s further enhanced ongoing industry-university dialogue around current and future skills requirements.

- **Introduction of the Professional Science Master's (PSM)** degrees through scholarships to the U.S. and establishing PSM programs in Philippine universities. **PSM** degrees require direct and sustained input of industry into curriculum and internships, institutionalizing university-industry collaboration.

- **Multiple industry-oriented grants mechanisms** were deliberately structured to support innovation, academic-industry collaborations, and collaboration with U.S. universities.

- Promotion of **cross-agency collaboration** in GPH through ongoing engagement, effective study tours, exposure to top American experts in innovation and research management, and others. STRIDE has been perceived as a trusted and neutral development partner with significant convening power and a reputation as an honest broker. As such, STRIDE has been well-positioned to work across agencies and institutions to catalyze sustainable relationships that any individual GPH agency might not have been able to achieve effectively.

The HEEAP Alliance has focused on pedagogical, administrative, and institutional capacity and curriculum improvements to aid in reaching international standards. Vietnam's MOET maintains tight control over university curricula; authority over the partner universities is shared among ministries including MOLISA and others. This meant that significant confidence-building was required before the HEEAP Alliance gained permission to directly address curriculum and quality assurance issues.

Table 2: HEEAP Alliance

HEEAP 1.0	HEEAP 2.0 (VULII)	HEEAP 3.0 (BUILD-IT)
1. Champions Leadership Committee Meetings **2.** HEEAP Faculty Development Trainings **3.** In-Country Workshops **4.** Intel HEEAP Technical Vocational Female Scholarship Program **5.** Annual Vietnam Engineering Education Conference **6.** World Bank Solutions Network **7.** HEEAP Website	**1.** Quality Assurance Institute **2.** Rector Leadership Institute **3.** Technology to Enhance Institutional Operations **4.** Dean's Leadership Institute **5.** Program Leaders and Senior Faculty Development **6.** Outreach Activities to non-VULII Personnel	**1.** Leadership and Strategy Towards University Autonomy **2.** Academic Program Quality Through ABET/AUN-QA Compliance **3.** Applied Project Based Curriculum Implementation

As a result, HEEAP 1.0 focused on engineering pedagogy, with the primary intervention being training Vietnamese engineering faculty (at ASU and in Vietnam) on best practices to promote active learning. HEEAP 2.0 provided training and capacity building for university rectors, vice-rectors, deans, and vice-deans to develop modern institutional strategic planning capacity; increase institutional research, evaluation, management principles, financial planning, and assessment; and develop better quality assurance and curriculum development infrastructure. Following almost five years of trust-building, BUILD-IT was able to more directly address institutional policy, quality assurance, curriculum, faculty innovation and technology, and accreditation.

Based on a review of project documents and our interviews with stakeholders, HEEAP brought both novel interventions and intervention approaches. In the current phase (BUILD-IT) these include:

Building faculty capacity to lead project-based learning: An ongoing theme of the HEEAP Alliance has been sustainable long-term faculty development and wide-scale implementation of innovation and modern methodologies. To date, more than 100 faculty members in Vietnam have applied for the Master Teacher Training through a Certified Facilitator program established by HEEAP. This training equips tertiary faculty in STEM programs with pedagogical tools to assist them in transforming their courses and classrooms and to develop a student-centered approach through the integration of hands-on, concrete experiences, educational technology, and current teaching practice.

Providing cutting-edge technology via the Alliance model: Partners in the HEEAP Alliance mobilized very significant in-kind contributions of cutting-edge hardware and software to build teaching lab capacity in partner universities (further details in section VIII-B below).

Structuring interventions around a pathway to regional and international accreditation: Through BUILD-IT, university academic leaders and quality assurance professionals implement robust assessment and evaluation systems for continuous program improvement, supporting international accreditation recognition.

Developing further opportunities for students to benefit from hands-on learning through community service, competitions, and maker-spaces: Through private-public partnerships, educational institutions establish project-based curricula including hands-on learning opportunities that strengthen industry-university linkages across multiple platforms. BUILD-IT develops curricular partnerships, mentorships, and practical industry-sponsored opportunities to build students' professional and technical competencies in preparation for technology and engineering careers. Featured project-based programs offered through BUILD-IT include the Engineering Projects in Community Service (EPICS) course, Oracle Academy database curriculum, Amazon Web Service cloud computing curriculum, and automation programming and competition. Twelve thousand students participated in hands-on project-based curricula by mid-2018. BUILD-IT also established two innovation maker spaces in Ho Chi Minh City and Da Nang, with a third maker space to be launched by the end of 2018, to support applied curriculum and project-based learning models.

VIII. PARTNERSHIPS

STRIDE's theory of change and technical approach rest on engagement and facilitation of locally-led academic-industry-government partnerships supported by the capabilities of leading U.S. research universities, U.S.-based associations, and the implementing partner, RTI International—which is itself a scientific research institute. As such, developing a healthy matrix of geographically-distributed partnerships has been a major—if not the major—focus of the project. Given the low initial levels of interaction and trust between universities and industry, this has also been a major challenge of the program.

HEEAP took a more targeted approach, selecting Vietnamese university partners, focusing on bringing resources to the five universities most likely to provide Intel and peer companies with top engineering talent, and, later, to selected electronics-focused technical colleges. The Alliance was extremely successful in mobilizing large in-kind contributions of software and capacity building from global technology brands to enhance student exposure.

A. Partnerships with Local Universities

STRIDE engaged with a wide and geographically-diverse array of Philippine universities selected principally for revealed interest in industry-relevant research and establishment of KTTOs and Career Centers.

STRIDE has engaged more than 110 Philippine universities and colleges throughout the program, working at multiple levels (executive leadership, research administration and technology transfer, and teaching faculty) to generate interest in capacity building that would enable more effective collaboration with industry. This required direct outreach by STRIDE through "roadshows" to explain the program and the grants available to universities, and partnership with numerous local organizations to reach all appropriate university stakeholders—most particularly the Intellectual Property Office of the Philippines (IPOPHIL) to identify the universities with the most active intellectual property operations.

STRIDE began at a time when university presidents were under significant pressure to undertake revenue-generating activities to supplement public budgets. As a result, conversations with industry often moved prematurely to revenue. A critical job for STRIDE was persuading university leaders that revenue might follow from building better relationships with industry (through project instruments including collaborative research and establishment of KTTOs and Career Centers), but that these relationships needed to focus on shared interests in knowledge creation rather than immediate revenue. STRIDE brought several American experts/university leaders to counter the belief "that technology transfer is a big money-making machine."

The HEEAP Alliance worked with five core university partners with graduate electrical or mechanical engineering programs.

These are Da Nang University of Technology (DUTE), Ho Chi Minh City University of Technology (HCMUT), Ho Chi Minh City University of Technical Education (HCMUTE), Can Tho University (CTU), and Hanoi University of Science and Technology (HUST). The Alliance also worked with three technical colleges with electronics programs: Industrial University of Ho Chi Minh City (IUH), Ho Chi Minh Vocational College of Technology (HVCT), and Cao Thang Technical College (CTTC).

In HEEAP 1.0, the universities sent teaching faculty and staff to participate in trainings at ASU and in Vietnam, and technical colleges participated in local training. In total, the universities sent 155 professors or staff to these trainings. HEEAP 2.0 (VULII) sought to affect the administration of these universities, working with Rectors and Deans. The five universities and three technical colleges sent rectors, sub-rectors, deans, or sub-

deans to these trainings. Overall, 130 institutional leaders, 190 faculty, 17 quality assurance directors, and 156 higher education personnel were trained through the VULII program.

BUILD-IT required a higher level of buy-in from universities and the Government of Vietnam to improve curricula and move Vietnamese universities toward readiness for international ABET accreditation. BUILD-IT also establishes more-permanent operations, fab labs, and other offices at the university partners. Eleven universities have participated in BUILD-IT, of which six had not previously been affiliated with HEEAP programming.

Challenges and Lessons Learned—Local University Partnerships.

STRIDE planned to engage with eight first-tier universities and eight second-tier universities, but the process of extensive outreach yielded greater-than-expected levels of interest from potential university partners and intense interest from several smaller, private, and less research-oriented universities. Several smaller universities with strong leadership became extremely active and successful STRIDE partners. These included the private Technological Institute of the Philippines (TIP) and state universities—the University of Technology of the Southern Philippines (USTP) and Mindanao State University-Iligan Institute of Technology. At the same time, some of the Philippines' larger, more established research universities perceived that they had less to gain from engaging with STRIDE. As a result, both USAID and the implementing partner consider a key lesson learned to be, *"Don't only go for larger/prestigious, flagship, or legacy universities. Seek diversity, work with the most motivated institutions, and expand reach via a diversity of institutions."* STRIDE leadership and USAID agreed that the willingness to "show up" to STRIDE events and engage directly with industry through innovation workshops was the proxy measure of institutions' motivation.

Interviews with the presidents or rectors of two participating Vietnamese universities suggest that the five principal institutions of the HEEAP Alliance have achieved significant improvements in teaching quality, adoption of technology for teaching and education management, institutional commitment to achieving global accreditation, active relationships with employers, and enhanced prestige. This is consistent with Intel's mission of creating a world-class pipeline of highly skilled engineers.

However, spillover benefits to other institutions appear to be limited, to some extent by design. Though BUILD-IT has brought in six additional universities and the program's annual HEEAP conferences (later renamed STEMCON) showcased achievements to the wider university audience, there is no evidence that changes have permeated to the broader Vietnamese university community. Current representatives of Intel, in fact, suggested that Vietnamese universities generally are facing more numerous and significant challenges than

when the HEEAP Alliance began. At the same time, the five core engineering universities are becoming more selective—with applications growing in one case by more than 20 percent annually, in recognition of high graduate placement rates.

To ensure more effective partnerships with local universities, ASU also emphasizes getting high-level local administrators and system-level leadership involved at the outset and working with them to ensure that their strategic plans and key performance indicators (KPIs) are aligned with the project's goals. They found that university leaders who won't participate in an intensive up-front process of aligning goals probably won't do the work to make the project a success. In this sense, both STRIDE and the HEEAP Alliance used an assessment of local university leaders' willingness to meaningfully engage as a requirement for support from the project.

STRIDE Innovation Workshops have been described as speed-dating between industry and academics who came together to solve sector-specific technical problems. In the morning, industry identified and presented three major technical challenges, while in the afternoon they jointly brainstormed obstacles and potential solutions. Promising solutions could apply to STRIDE for CARWIN grants, cementing nascent collaborations.

B. Private Sector Partnerships

STRIDE worked with more than 200 Philippine industry partners through Innovation Workshops, faculty externships, and guest industry lectures in universities and further strengthened these ties with collaborative research grants, industry-focused Career Centers, and KTTOs. STRIDE intended to build the STI capacity of key economic sectors through research- and technical services-focused partnerships with Philippine universities. Partnerships with Philippine industry were principally initiated through outreach through the rich mix of Philippine sectoral or business chambers/organizations (two Philippine semiconductor associations, American Chamber, Palawan Chamber of Commerce) to build awareness and then through Innovation Workshops in which university faculty and industry technical personnel were brought together by STRIDE.

Two STRIDE grant programs—Collaborative Applied Research with Industry (CARWIN) and Academic Grants for Industry-Led Applications (AGILA)—were designed to cement university-industry collaboration for research and product development. As of late 2017, STRIDE had issued 35 CARWIN grants ranging in value between $35,000 and $225,000. Formalization of industry partnerships typically occurred through grant applications for specific collaborative research projects, rather than through memoranda of understanding (MOUs). Two STRIDE partner companies also noted that collaborative research projects had the secondary effect of building their hiring pipelines, exposing them to undergraduate and graduate students who may be potential future hires.

According to STRIDE Chief of Party David Hall, "To increase graduate employment, you need contact between employers and universities and an employment-ready curriculum." STRIDE's combination of Career Centers, KTTOs, and PSM degrees also brought industry into more frequent contact with curriculum development, augmented by industry guest lectures, faculty externships, and industry-based projects. This level of contact has brought about organic evolution of university curricula based on stronger relationships and contacts.

The HEEAP Alliance engages both multinational employers active in Vietnam and global technology providers that have contributed significant software and training on an in-kind basis and facilitates structured industry-academic consultations. The HEEAP Alliance's approximately 15 private sector partners have included Intel, Cadence Design Systems, Siemens, Danaher, Microsoft, Pearson, Autodesk, Cadence, and

Oracle. Most engaged beginning with BUILD-IT, making in-kind contributions to build university assets and workforce skills in the local ecosystem in which their products would be deployed. This has included Amazon's support for incorporating cloud-based services into academic programs and support from Microsoft, Oracle, Autodesk, IBM, and others to promote their industry-based certifications or credentials.

As ASU worked with partner universities on how to create more work-ready students, all parties recognized the need for improved hardware and software for teaching labs. This was particularly critical to help Vietnamese universities align their curricula and facilities to international accreditation standards and the requirements to demonstrate learning outcomes. Lack of labs, or labs with poor quality hardware and outdated or pirated software, were a barrier to accreditation-readiness. Software providers contributed to BUILD-IT through extensive in-kind donations of software and technology and by lending their technical expertise to train university faculty in using their technologies and incorporating them into learning experiences.

Regular and meaningful consultation with industry is also a requirement for ABET accreditation. VUULI and BUILD-IT supported the development of industry advisory boards for each supported engineering program and coached universities in how to work with industry. These boards typically meet two to three times a year and include engineering managers and directors of partner companies with a direct interest in program improvement. In some cases this has led to more direct investment by partner companies in the universities than has been captured in reporting to USAID—including, for example, significant contributions by Siemens in digital Internet-of-Things manufacturing labs and teaching labs in several HEEAP partner institutions, in addition to in-kind software contributions.

> The consortium model makes private sector participation easy and partners love the turnkey nature of this model. They bring their specialized training, services, etc., and ASU handles all logistics— thereby maximizing reach at lowest effort.

Challenges and Lessons Learned—Private Sector Partnerships. One key challenge for STRIDE has been demonstrating to industry that universities have requisite technical knowledge and the willingness to engage in collaborative problem-solving. Private sector leaders interviewed for this brief were candid about their initially low opinions. They admitted that exposure through STRIDE had revealed previously unknown strengths in partner universities. Industry representatives also conceded that many Philippine companies were reluctant to share specific technical challenges with potential university partners, thereby limiting STRIDE's effectiveness in facilitating research-driven solutions. Additionally, USAID indicated that the program should have focused more on small and medium-sized enterprises (SMEs) who have more local control over research collaborations than multinationals and have access to fewer global resources. These factors may make SMEs more receptive and committed partners.

All private sector partners we consulted gave strong praise to HEEAP's model. They praised it as an optimal "channel partnership" that allowed them to specialize in providing Vietnamese university partners with technologies and capacity building at scale while delegating administrative and coordination issues to the implementing partner.

Both U.S. industry partners and university leaders, however, mentioned that the HEEAP Alliance could have worked harder to engage Vietnamese companies—particularly SMEs—and Vietnam's emerging (and increasingly youth-driven) entrepreneurial sector. This appears to be a structural feature of HEEAP's model. It has been efficient in deploying large in-kind donations from leading global brands and in focusing on the skill needs of the global manufacturing sector. This approach does not favor local entrepreneurial and SMEs.

C. U.S. University Partnerships

Three U.S. universities were proposed by the implementing partner and engaged as STRIDE consortium members. FSU's Learning Systems Institute and U of M/WDI are university-based service delivery organizations. The School of Environmental and Biological Sciences (SEBS) at Rutgers was engaged directly. Partnerships were initiated and formalized through sub-grant agreements and maintained through annual work-planning. **Rutgers** was instrumental in assisting Philippine universities in developing PSMs and in assisting universities to improve collaboration with industry. **U of M/WDI** focused on strengthening Career Centers and was also able to draw on experienced administrators from Stanford and University of California, Berkeley. Their involvement was described as catalytic by USAID/ Philippines. **FSU** assisted directly with reorienting Philippine universities' technology transfer offices towards a broader knowledge transfer and partnership facilitation role, supporting more effective industry engagement. FSU also supported Career Center development and upgrading. The program also collaborated with more than 20 U.S. universities that hosted Philippine PSM degree scholarship students and PhD "sandwich" research.[4]

ASU, a globally-recognized innovator in 21st century higher education, was selected by Intel as the implementing partner at the outset of the Alliance and maintained its role as implementing partner throughout three phases of USAID support. All the partners consulted during the preparation of this research brief gave ASU favorable reviews with respect to this role. Partners expressed appreciation that ASU brought ongoing engagement by ASU's President, which raised HEEAP's profile with GVN and Vietnamese university partners alike; expertise and innovative leadership in modern engineering pedagogy including online and blended learning; and deep and ongoing relationships with corporate partners. In BUILD-IT, Portland State University and the Catholic University of America joined the Alliance to provide specific training on Executive Leadership and Quality Assessment, respectively. However, their overall roles in the HEEAP Alliance were modest.

Challenges and Lessons Learned—U.S. University Partnerships. One key learning from STRIDE is the importance of maintaining the option of working with a large array of U.S. universities. A key to success was the STRIDE implementing partner's decision to maintain ***openness to working with U.S. university partners outside of the three core consortium members, permitting access to the entire universe of American academic assets in STRIDE's research and student and faculty exchange partnerships.*** This structure allowed demand-driven partnerships to emerge after STRIDE identified key scientific priorities and opportunities, the selection of which would have been premature at proposal phase.

4 A sandwich research grant funds one year of research at a U.S. university "sandwiched" between two years of research or coursework in the home country.

A second key learning was that ***U.S. universities' professionally-managed external service-oriented (or "consultancy-oriented") centers***—the William Davidson Institute (U of M) and the Learning Systems Institute (FSU)—are organized to work more effectively at the administrative level with external projects than are the more procedurally-bound academic departments. These centers excelled in faster decision-making and greater familiarity (and therefore easier compliance) with USAID procedures. Compliance issues can strain the capacities of academic faculty members and departments. U of M's structure and orientation also made it easier for them to deploy highly specialized experts from other U.S. higher education institutions who effectively supported Career Center development. The STRIDE experience suggests that USAID should carefully consider whether potential universities and their lead academic departments have the administrative capacity to be effective implementing partners.

The HEEAP Alliance's *one-university-as-implementing-partner* model may seem to carry higher performance risks than a multi-partner model. Such risks, however, did not manifest themselves in the HEEAP Alliance, according to mid-term evaluations and partner feedback. Sub-grants to two partner universities under BUILD-IT demonstrated the model's ability to bring in additional resources. Three characteristics of ASU as an implementing partner likely contributed to success: (1) broad academic and technical assistance capabilities; (2) implementation-friendly administrative structures; and, (3) excellent relationships with global industry partners who provided significant in-kind donations and capacity building through the Alliance. Effectively maintaining such a consortium model requires longstanding and high-level relationships with industry partners at headquarters that can survive companies' frequent transitions among local leadership/management. In this sense, ASU's deliberate orientation towards industry may be somewhat unique among potential university partners. Similar ability to mobilize private sector resources should not be assumed for all university implementing partners.

D. Partnership with Host Country Governments and Governance Arrangements

STRIDE had a relatively diffuse coordination structure with host country government entities, which held both advantages and disadvantages. In lieu of a single GPH counterpart department, STRIDE convened an Advisory Board comprised of USAID; industry representatives (such as the Philippine Chamber of Commerce and the American Chamber); the head of the National Academy of Science and Technology; the cabinet secretaries of the National Economic and Development Authority (NEDA), the Department of Trade and Industry (DTI), and the Department of Science and Technology; the head of the Intellectual Property Office of the Philippines (IPOPHIL); the chair of the Commission on Higher Education (CHED); the president of the Philippine Association of State Colleges and Universities (PASUC); and others. This body met semi-annually and provided executive-level support to the program.

Vietnam's centrally-controlled higher education bureaucracy required a high degree of coordination with GVN ministries. This emerged as one of the major themes of the HEEAP Alliance. The project's main GVN counterparts, MOET and MOLISA, were consistently engaged through the activities. But the complexity of GVN reporting structures and lines of authority made coordination across Vietnam's ministries time-consuming and difficult, according to both ASU and Intel. In the VULII final report, ASU noted:

> *"Rector efforts to change and improve their institutions continue to be hampered by ministry control and bureaucracy. For instance, one institution possessed funds to move forward with a step in achieving international accreditation but had difficulty obtaining explicit permission from someone in their oversight ministry to expend the funds. This was in spite of the ministry previously indicating the activity was important and should be done."*

Challenges and Lessons Learned—Host Country Governments and Governance Arrangements. An unexpected learning that emerged from STRIDE was the need to support intra-GPH collaboration—particularly among CHED as the regulating body for higher education, DOST as the key grant-making agency for research, and DTI as the main industry development actor. As the USAID AOR stated:

> *"From the beginning, our goal has been to make friends and build trust. We started with the notion of getting industry and academia together, but we didn't consider that we needed to help the Departments of the GPH to make friends with each other. That's the shift and a key lesson learned."*

When the Department of Science and Technology (DOST) eventually engaged with STRIDE, promising industry-focused research funding practices were mainstreamed into GPH policy through Collaborative Research and Development to Leverage [the] Philippine Economy (CRADLE)—a DOST grant mechanism similar to STRIDE's CARWIN. The STRIDE extension will provide further technical assistance to GPH to support the development of a policy framework that aligns these priorities. A second key learning was that there were both advantages and disadvantages of having multiple counterparts within the Government of Philippines. While this arrangement avoided risks of inter-departmental rivalry, it did require that both USAID and the implementing partner use more "power of persuasion" because no single department was responsible for outcomes and therefore no single champion within government emerged.

In contrast, in Vietnam, USAID played a crucial role in helping the HEEAP Alliance navigate the complexities of working with more control-oriented ministries of GVN. The Intel-ASU relationship already brought some degree of status with GVN stakeholders due to widespread interest in growing the technology manufacturing sector. USAID's engagement helped the Alliance understand the regulatory environment and eventually gain the confidence of GVN ministries so that it could work directly on curriculum and accreditation issues under the BUILD-IT project.

IX. ADDRESSING GENDER EQUITY AND SOCIAL INCLUSION (GESI)

STRIDE's GESI objectives were: (1) to improve the Philippines' already strong performance of women in leadership in science and technology and (2) to improve geographic equity in the Philippine research enterprise by extending the prevalence of university-based innovation beyond Metro Manila. STRIDE entered a Philippine higher education sector in which women shared relatively equitably in higher education leadership roles, including the Chairperson of CHED and presidents of several partner universities. At the same time, despite many women excelling in academia, gender disparities are exaggerated in science and technology disciplines. STRIDE worked through nine workshops (including three workshops in CDI cities) reaching 162 participants to ensure awareness and sensitivity to these challenges among university partners.

In light of the Philippines' significant pre-existing progress in gender equity, greater emphasis was placed on STRIDE's geographic equity mission, which supported USAID's CDI goals. STRIDE is reported to have had a democratizing influence on the STI funding practices in the Philippines, opening new doors for smaller and more remote research institutions that previously had difficulty obtaining research grants. One female faculty member who received two STRIDE grants reported that, "Outreach around the country made grants more accessible to provincial universities and academics. Now the distribution of research grants is quite fair, even (for provincial universities). Before, grants were concentrated in Metro Manila, in big universities."

The HEEAP Alliance supports women's participation in STEM because of a consensus among Alliance partners that many more women will need to be trained in STEM to close Vietnam's engineering workforce gap. This requires both a culture change among girls and their families with respect to STEM and specific activities designed to build a community around women in engineering in Vietnam. HEEAP incorporated a strong emphasis on women in STEM through several vehicles. The Alliance hosts a biannual conference

(WiSTEM) bringing female high school and university students together with female corporate leaders from the STEM fields. Corporate partner Intel provides engineering scholarships for women. Dow Chemical sponsors competitions and introduced a service-learning sequence for engineering education designed to change perceptions among female students about how engineering can positively impact communities.

Despite these initiatives, partner universities reported difficulty in meeting hard targets (10 percent) for enrollment of women in STEM programs, noting longstanding cultural barriers and lack of on-campus resources to support women in these fields. These challenges highlight the need for long-term changes in both on-campus and cultural practices in Vietnam that will require sustained work.

X. HOW THE PROGRAM'S PROMOTED SYSTEM-LEVEL TRANSFORMATION TO SUPPORT LOCAL HIGHER EDUCATION SYSTEMS' PROGRESS TOWARDS SELF-RELIANCE

The two programs approached system-level transformation with different objectives, but both models that emerged offer pathways to more robust systems that facilitate academic collaboration with the private sector, enhancing institution-level leadership and autonomy to forge win-win partnerships based on common interests.

USAID, the implementing partner, Philippine private sector partners, and faculty researchers agreed that the STRIDE program had created durable change in the behaviors of key actors and the structure of relationships among academia, industry, and government in the Philippine innovation ecosystem. Among these were the following:

- **Improved research capacity, capability, competence, and confidence** in universities and university faculty. This includes helping young faculty returning from PhD studies abroad to obtain the equipment and facilities needed to conduct high-quality research and adopting better internal policies to support faculty research, most notably the rational reductions of teaching loads to permit time for research.

- **Improved industry confidence** in working with Philippine universities and better understanding of collaboration by universities. Some evidence of this claim comes from industry's willingness to provide a 1:1 match in recently-awarded grants.

- **Improved awareness and mechanisms in Philippine universities of benefits and approaches to working with industry.** Widespread establishment of STRIDE-promoted KTTOs (40 universities) and Career Centers (8) evidence a shift toward a more open approach to industry collaboration. Graduate and undergraduate students are also gaining industry exposure through faculty-led research.

- **Improved GPH understanding of innovation and the roles of universities and other stakeholders and improved cross-governmental collaboration** on national innovation issues. This focus was formalized in Chapter 14 of the 2017–2022 Philippine Development Plan, which cited research conducted by STRIDE. A faculty member reported:

  > *"The partnership between universities and government is getting very harmonious. DOST, CHED are now very good at campaigning for research funds for universities, and already providing really fair treatment (to large and small HEIs). I also think STRIDE influenced the people sitting in DOST and CHED. Because most STRIDE-funded projects became successful, this enticed DOST and CHED to do the same."*

- **Democratizing influence on the STI funding practices in Philippines**, opening new doors for smaller and more remote research institutions that previously had difficulty obtaining research grants. One female faculty member who received two STRIDE grants reported that STRIDE had dramatically improved the situation, and that as a result, "[she is] more likely to stay in Philippines due to [expanded] grant support."

Taken together, these changes appear to represent a significant increase in the self-sufficiency and resilience of the system supported by STRIDE. The new GHP's CRADLE grant mechanism assumes responsibility for supporting university-industry collaboration. Additionally, by the end of year 4, STRIDE reported three attributable improvements in GPH STI policy and substantially exceeded program targets for university-generated innovations introduced into the commercial sector. Both suggest real progress towards a self-sustaining system of academic-industry collaboration. Unfortunately, no external evaluations providing hard data on system-level changes or improvements in resilience are available for STRIDE. Both USAID and the implementing partner recognize the need for GPH and universities to develop more robust systems and capacities that perpetuate these gains. A recently-approved costed extension of STRIDE will provide GPH and universities with technical assistance to build such systems.

The HEEAP Alliance, on the other hand, began with the ultimate goal of bringing about a transformation of engineering education in Vietnam by fully integrating leading Vietnamese universities into an independent international accreditation system. This system would, by its very nature, require developing a culture of intra-institutional collaboration, measurement of learning outcomes supporting continuous improvement, applied and project-based learning, private sector consultation, and peer evaluation. The central focus on accreditation would ensure that improvements in Vietnamese universities are institutionalized with accompanying processes of continuous improvement and are therefore resilient and self-sustaining beyond the program(s).

Significant progress towards this outcome has been made. ASU reports that 60 programs are expected to be accredited by the ASEAN University Network (AUN) by 2020, and 20 are expected to have ABET accreditation—the "gold standard" of engineering education—by 2022. At that time (2022), Vietnam could have the most regionally- and internationally-accredited university and technical college engineering programs of any country outside of the U.S.

This progress indicates that Vietnam has accepted the challenge of raising higher engineering education quality to global standards and has moved—perhaps not yet decisively—towards accepting a self-organized accreditation model that depends on independent review by global peer universities and regular consultation with private employers (in contrast to a centralized model). In addition, the highly significant in-kind contributions of technology by Alliance partners have demonstrated to GVN stakeholders the benefits of public-private partnerships in enhancing workforce-relevant educational experiences for Vietnamese students.

XI. SYNTHESIS AND CONCLUSIONS

The foregoing brief reveals that higher education programming can respond to diverse educational needs pertaining to a host country's economic and workforce development. What general conclusions can be drawn from the experiences of two such dissimilar programs? Three conclusions stand out.

First, these programs demonstrate that the way to self-reliance for host country higher education is through virtuous circles of government-industry-academe collaboration and investment. At their best, the ecosystems supporting higher education encompass a mutually-reinforcing "triple helix" of government, business/private sector, and universities. Government is almost always the principal funder of both higher education and university-based research, but where universities perform research and teaching that is relevant to the economy, private actors may also become active partners and supporters—creating a virtuous circle of public and private investment. USAID's higher education programming can influence many factors: the capability of universities to conduct research, provide services, and skills; the quality of academic programs enhanced by adherence to global standards; and ongoing consultation and partnership with industry. The private sector (both local and global) must also be willing to invest in higher education through funding for research partnerships and facilities, in-kind contributions of hardware and software, and mutually-beneficial commercialization activities that stem from joint research.

HEEAP and STRIDE address the objective of self-reliance in two ecosystems at different stages of development. The greater emphasis in Vietnam on attracting global industries in large-scale manufacturing led the HEEAP Alliance to focus on delivering engineering skills that, in turn, have led Siemens and others to make additional investments in upgrading higher education institutions. STRIDE focused on research in support of upgrading towards an innovation-driven economy, catalyzing the adoption by GPH of grant mechanisms that promise to further incentivize joint university-industry applied research and development. These programs demonstrate that the starting-points for ecosystem strengthening may vary based on initial conditions and objectives but may have similar results in catalyzing the virtuous circle of new investments.

Second, countries will differ in readiness for transformative change and the obstacles that programs must address. Even when host country governments are highly motivated, programs must address pre-existing institutional legacies, systems, and procedures in order to achieve results. USAID should recognize that implementation may need to proceed in stages to build confidence and readiness according to local needs.

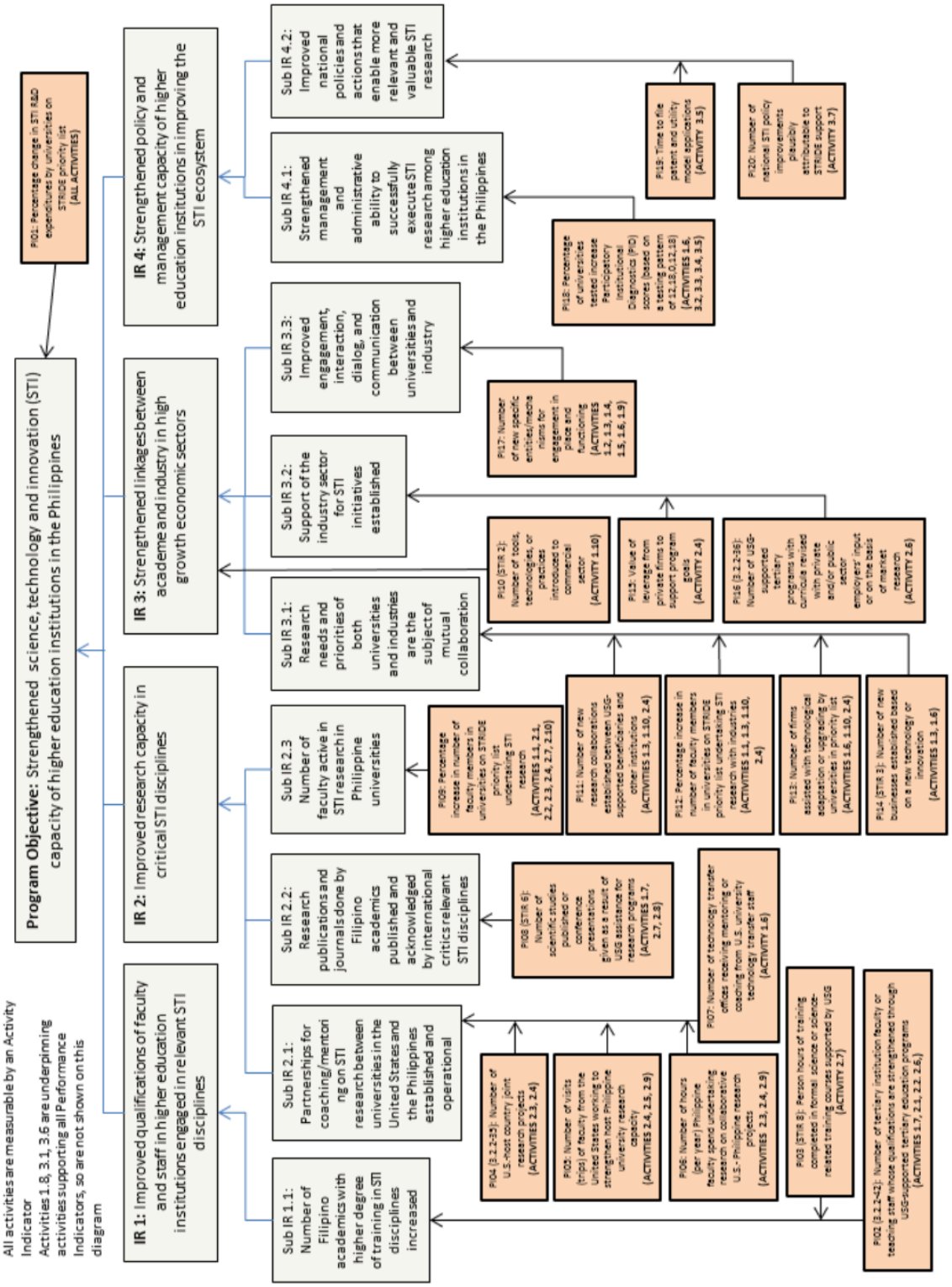
STRIDE and HEEAP approached this challenge according to their program structures and objectives. In overcoming lack of trust or indifference between universities and Philippine companies, STRIDE focused on brokering local research alliances between industry and academia through innovation workshops and subsequent CARWIN grants. STRIDE also worked intensively with universities through Career Center and KTTO development to create institutional mechanisms for ongoing communication and collaboration with employers and to expose faculty to modes of collaboration. The HEEAP Alliance's challenge was to create readiness among system stakeholders to restructure engineering education and align it with global accreditation standards, affecting all aspects of education (applied learning pedagogy, assessment, curriculum development, industry relations, and use of IT). HEEAP's multi-stage approach was designed to build confidence in GVN ministries that were uncertain about ceding the quality control function to international accreditation bodies—gradually building awareness and demand for change among faculty, institutional leaders, and relevant ministry officials.

Third, local private sector actors will have diverse interests and capacities for engagement. Private sector companies are the employers, technology providers, and innovators that can motivate and enable higher education to become more effective and economically relevant. Both programs had important strengths as well as limitations in forging partnerships with private sector stakeholders. Although it is typically relatively easy to bring employers to the table around workforce skill needs, program designers must not treat the private sector as monolithic or assume that all companies have similar needs, capabilities, or interest in engagement.

For example, one strength of working with multinational companies such as those engaged with HEEAP is that most—including Oracle, Amazon Web Services, Microsoft, Autodesk, and others—have academic collaboration programs that can plug in relatively smoothly to an implementing partner's programs and deliver significant value. Multinational companies also tend to have formalized human resources functions that can help them anticipate and articulate their skills needs to higher education partners. On the other hand, as STRIDE discovered, multinationals' R&D agendas are typically controlled from headquarters and engagement with local researchers may be limited by global intellectual property and other strategic concerns.

At the same time, stakeholders in both programs lamented the relative lack of engagement with SMEs as program partners. SMEs are typically a source of both job growth and dynamism in emerging economies. However, not all SMEs will have the mature management systems or R&D capabilities required to engage effectively with higher education institutions or programs, even though most will benefit from the availability of highly skilled graduates in the workforce. In some cases, local universities and the higher education programs that support them can help SMEs anticipate and articulate their skill and technology needs by, for example, working through industry associations. STRIDE used Innovation Workshops to simultaneously build university and company capacity to identify and address research needs. However, programs should avoid pushing universities to engage before they have the skills or orientation to provide useful services or participate in effective partnerships. Similarly, if companies aren't prepared to share information about their technical or workforce challenges, effective partnerships will be difficult.

ANNEX 1: STRIDE RESULTS FRAMEWORK WITH CONTRIBUTING ACTIVITIES



ANNEX 2: PRIMARY RESEARCH—INTERVIEWS

STRIDE

David Hall, STRIDE Chief of Party, RTI International

Angelo Q. Lahoz, Senior Vice President, Technological Institute of the Philippines

Sherwin Nones, Strategic Planning and Marketing Head, Integrated Micro-Electronics, Inc. (IMI)

Isgani Padolina, Director of Research and Development, Quality Assurance, and Business Development, Pascual Pharmaceutical Corp/ADP Pharma

Bernadeth Ticar, Senior Faculty Researcher, Iloilo Science and Technology University

Mir Shariff C. Tillah, USAID/Philippines/Office of Education

Note: In addition, the author conducted more than 50 interviews in 2014 with STRIDE stakeholders.

HEEAP

Do Van Dung, President, HCMC University of Technology and Education

(HCMUTE)

Jeff Goss, Associate Vice Provost and Executive Director of Global Outreach and Extended Education, Arizona State University

Damian Haas, Regional Director for Asia-Pacific, Oracle Academies

Sam Harris, Education Program Manager, APAC, Amazon Web Services

Uyen Ho, Public Affairs Director, Vietnam and Malaysia, Intel Corporation

Richard A. Howarth, Vice President, Technology and Manufacturing Group, Intel Corporation.; former General Manager, Intel Products Vietnam

Son Hoai Nguyen, Corporate Affairs Manager, Dow Chemical Vietnam LLC

Doan Quang Vinh, Rector, Da Nang University of Science and Technology

Stephen Berlignuete, Section Chief, Ho Chi Minh City, USAID/Vietnam

USAID/Washington

Samantha Alvis, Higher Education Specialist, Office of Education, Bureau for Economic Growth, Education and Environment (E3)

Mitch Kirby, Senior Education Advisor, Asia Bureau

Olga M. Merchan, Youth and Workforce Advisor, Office of Education

ANNEX 3:SECONDARY RESEARCH—DOCUMENTS REVIEWED

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