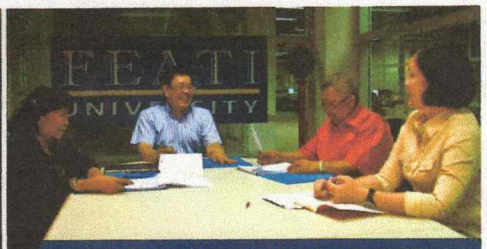
ENGINEERING ACADEMIC PROGRAMS

WASHINGTON ACCORD & PTC



GOOD TEACHER, GOOD ENGINEER

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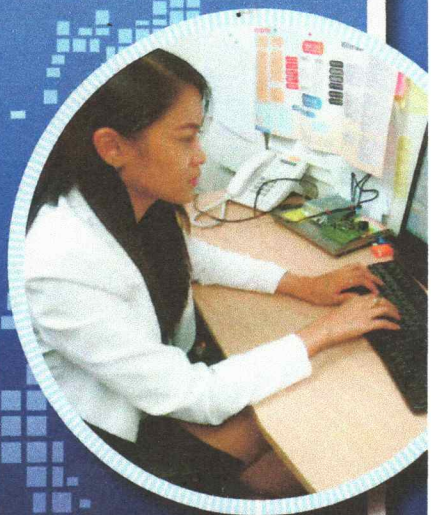
The Philippine Engineer



Philippine Perspectives in Engineering

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PHILIPPINE ENGINEERS IN THE CONTEXT OF ASEAN AND INTERNATIONAL INDUSTRY NEEDS

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PHOTOS BY **GEORGE V. CABIG**

A more dynamic and competitive ASEAN Economic Community (AEC) could be realized by 2015, bringing about a single market and production base. Part of the seamless interconnectivity of goods, services, and investments are people and skilled labor.

This mobility of skilled labor becomes more compelling knowing the significance of services to ASEAN. Services are a sizable component of the ASEAN members' GDPs, ranging from 35% to more than 60% in 2012. Foreign direct investments in services accounted for 61% of total ASEAN FDI from 2009 to 2012, with highest inflows spotted in Singapore, Indonesia, and the Philippines. ASEAN trade in services also reached US$529.9 billion in 2011.

Merely knowing these opportunities is not enough. It is critical to determine what actions must be taken to tap the wellspring of opportunities. While some programs are already being pursued in preparation for this, much work remains to be done. Aside from the Mutual Recognition Arrangement on Engineering Services (MRA) that fosters mobility of engineering professionals and services, actions to improve the competitiveness of our engineers must also be set into motion.

The Philippine Technological Council (PTC), an umbrella organization of 13 PRC-accredited professional engineering organizations, is in the best position to identify strategic developments that have implications not only in the engineering profession but also in national development and technical progress.

State of engineering in the Philippines: A briefer

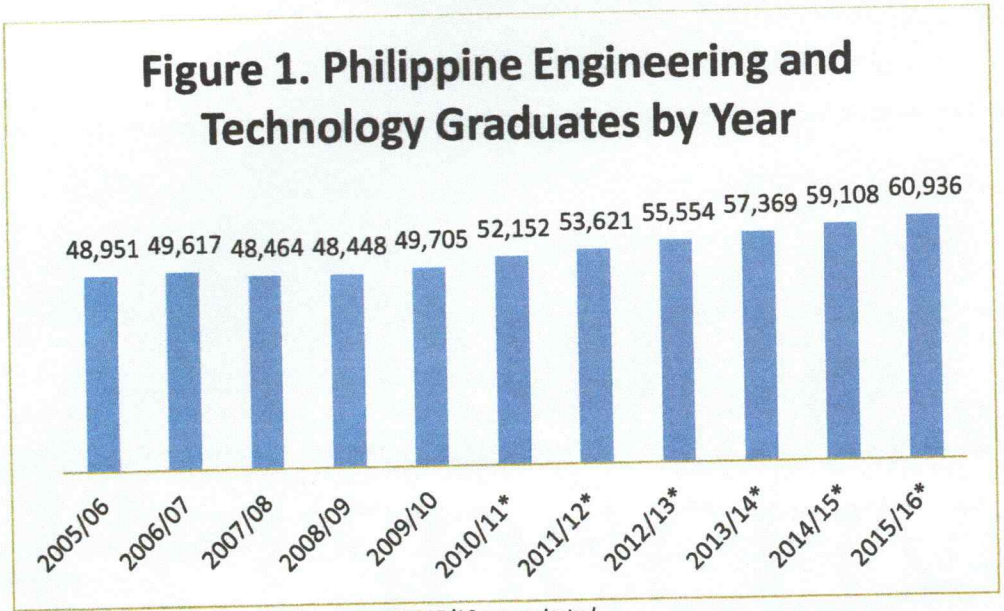
To begin appreciating the state of competitiveness of engineering, it might be prudent to look briefly at the status of engineering in the country and ASEAN.

Supply of engineers in the Philippines

From 2005-2010, graduates of engineering and technology programs in the Philippines remained steady at about 49,000 (Figure 1). As a share of total graduates, however, the number went down from 11.6% to 10.4% (Figure 2). Although it is projected that the absolute figures will rise in the next five years, the share is expected to remain the same.

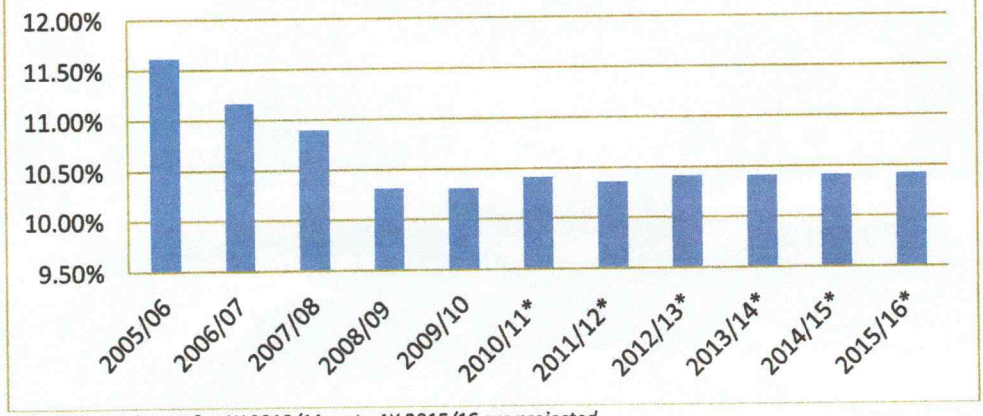
In 2013, around 27,000 engineering graduates took different PRC-administere licensure examinations for the first time.

Figure 1. Philippine Engineering and Technology Graduates by Year



*Data on graduates for AY 2010/11 up to AY 2015/16 are projected
Source of basic data: www.ched.gov.ph

Figure 2. Engineering & Technology Graduates as Percent of total annual graduates of various academic programs in the country



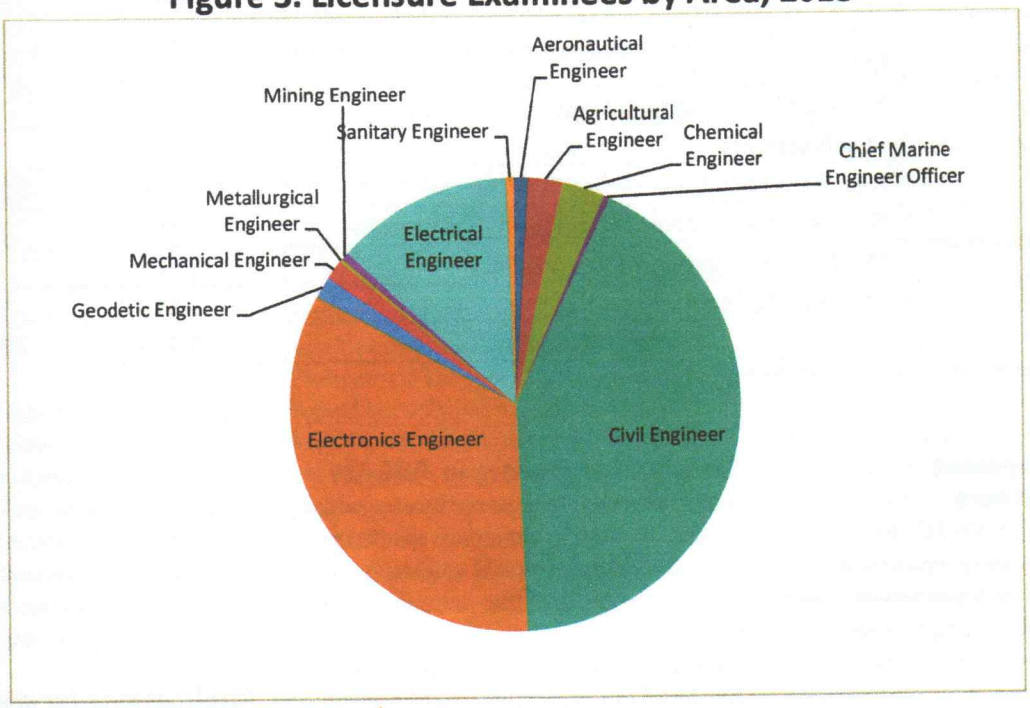
*Data on graduates for AY 2010/11 up to AY 2015/16 are projected
Source of basic data: www.ched.gov.ph

The bulk of the licensure examinees in engineering are concentrated in four areas: civil engineering, electronics engineering, mechanical engineering, and electrical engineering (Figure 3). Other fields, namely geodetic, aeronautical, metallurgical, mining, and sanitary engineering, comprised less than 3% of the total examinees. Moreover, passing rate in 2013 engineering licensure examinations went down to 47%. Mining and metallurgical registered the highest passing rate while electronics engineering posted the lowest (Table 1).

These figures pose critical development implications. Mining, agriculture, logistics, shipbuilding, housing, electronics, and infrastructure are among the priority areas of PDP 2011-2016. Yet in 2013, only a handful of graduates took and passed the exams. Furthermore, only 601 aspired to become licensed agricultural engineers and only 237 succeeded. Without these people, the agricultural backwardness stemming from antiquated technologies and decrepit infrastructure might remain unreformed.

It is then important to determine if we produce enough of the engineers we need and identify if we have surplus engineers in some fields but shortage in other equally important areas.

Figure 3. Licensure Examinees by Area, 2013



Source of basic data: www.prc.gov.ph

Table 1. Results of 2013 Licensure Examination in Engineering Programs (First Time Takers)

Occupation	Passed	Failed	Total	Passing Rate (%)
1. Aeronautical Engineers	113	135	248	46%
2. Agricultural Engineer	237	364	601	53%
3. Chemical Engineer	428	306	734	56%
4. Chief Marine Engineer Officer	59	45	104	62%
5. Civil Engineer	4,710	5475	10,185	44%
6. Electronics Engineer	2,884	5226	8,110	39%
7. Geodetic Engineer	144	240	384	52%
8. Mechanical Engineer	2,236	1064	3,300	71%
9. Metallurgical Engineer	28	23	51	83%
10. Mining Engineer	117	24	141	83%
11. Registered Electrical Engineer	1,643	1420	3,063	62%
12. Sanitary Engineer	86	47	133	69%
Total/Average	**12,685**	**14,369**	**27,054**	**47%**

Source of basic data: www.prc.gov.ph

Table 2. OFW Deployment by Occupation and Sex – New hires, 2010

Occupation	Male	Female	Total
Project Manager (Construction)	93	9	102
Chemical Engineers	35	3	38
Civil Engineers	1,682	49	1,731
Electrical and Electronics Engineers	1,266	24	1,290
Industrial Engineers	356	28	384
Mechanical Engineers	1,056	16	1,072
Mining/Mineral Mining Engineers	4	-	4
Ship Engineers	7	-	7
Engineers (N E C)	1,786	151	1,937
Electrical & Electronics Engineering Technicians	3,455	31	3,486
Mechanical Engineering Technicians	3,166	9	3,175
Engineering Technicians (NEC)	2,813	45	2,858
Total Engineers	**15,719**	**365**	**16,084**

Source: www.poea.gov.ph

Overseas deployment of Filipino engineers

In 2010, more than 16,000 Filipino engineers left the country for overseas employment (Table 2). Upon review, these data illustrate that departing Filipino engineers outnumber newly licensed professional engineers. If this rate persists, the massive emigration of engineers might threaten the domestic supply of Filipino engineers.

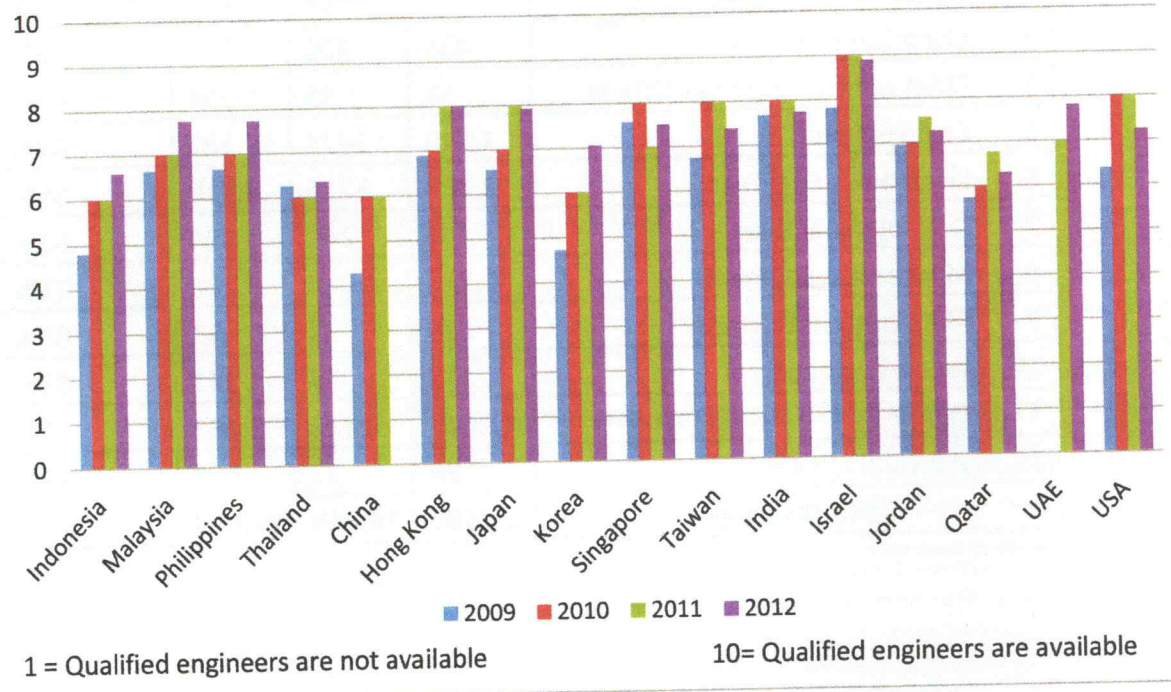
Supply of engineers in ASEAN

ASEAN's seriousness to nurture its priority sectors to maturity requires a corollary demand for highly skilled engineers. Global reports show that not only ASEAN but also advanced economies currently enjoy a good supply of engineers, and that this trend has been more or less growing through the years (Figure 4). This uptrend in the number of qualified engineers cannot solely claim that technical insufficiency has been addressed in view of competitiveness and development requirements. Furthermore, there is a need to identify who comprise this pool of engineers: Are they homegrown or do ASEAN/Philippines supply them?

Implications for competitiveness

As countries yearn for industrialization and economic growth, the plethora of opportunities overseas becomes more

Figure 4. Supply of Engineers within Labor Market



Source of basic data: IMD World Competitiveness Yearbook, 2009, 2010, 2011 and 2012

apparent as the demand for talent increases; indeed there is a global war for talent. Yet tradeoffs occur as countries tend to pursue overseas employment at the expense of their development.

If ASEAN or the Philippines prefers to promote professional employment abroad, then its actions should focus on capacity building and quality assurance of engineering programs, ensuring that its engineers comply with the international standards.

If, on the other hand, ASEAN or the Philippines intends to keep its engineering talents and employ them for its own development agendas, then it has to pursue different strategies beyond technically qualifying engineers.

Short-term concern: Technically qualifying engineers

Raising a global Filipino means working to technically qualify engineers not only for job requirements overseas but also for domestic work that is internationally benchmarked. Many of the concerns related to raising the quality of engineers have been long identified; they include the need to comply with international agreements on engineering education and registering in international registries of engineers.

International agreements on engineering education

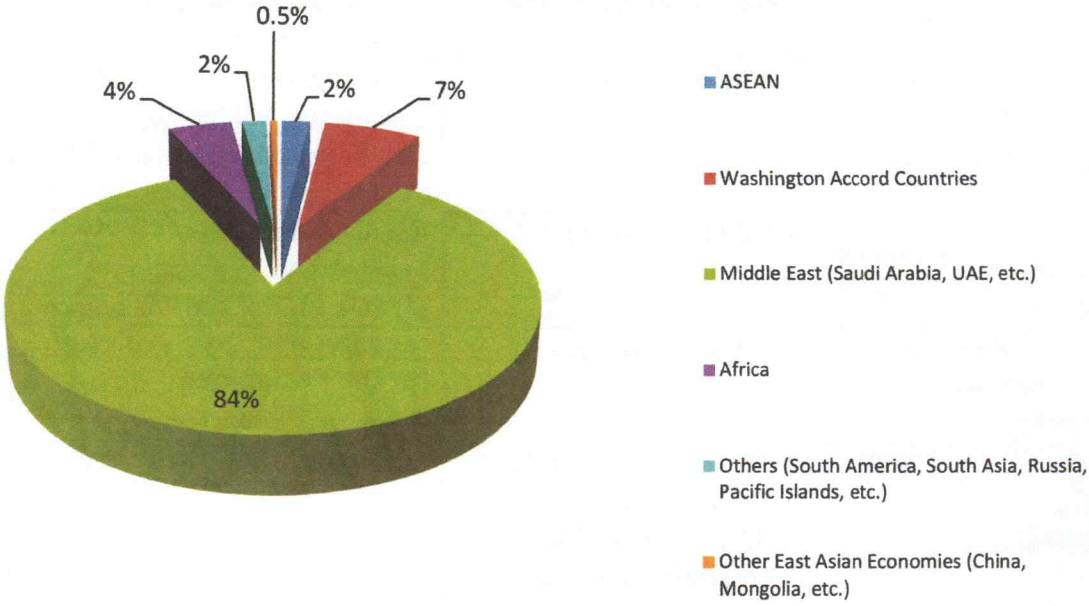
There are several international agreements on equivalency of engineering academic programs, such as the Bologna Declaration, the Washington Accord, the Western Hemisphere Partnership, the Sydney Accord, and the Dublin Accord. Of these agreements, the Washington Accord is poised to create the most significant impact on ASEAN and the Philippines. The Washington Accord, signed in 1989, has 17 signatories and five economies holding provisional status. Qualifications accredited by signatories are recognized by each signatory as being substantially equivalent to those accredited or recognized qualifications within its jurisdiction.

The majority of Filipino engineers are siphoned out of the country and are absorbed in traditional markets—for example, the various Middle East countries, which are not signatories to the Washington Accord. Only about 7% of Filipino engineers were employed in Washington Accord economies (Figure 5).

But Filipino engineers cannot rely solely on the Middle East as it is expected to experience a large decline in employment growth—from 4.5% in 2002-07 to 2.5% in 2014-16 (Table 3). There is also a long-term threat of enforcing laws replacing foreigners with local talents. However, Middle East engineering companies are beginning to hire engineers from Washington Accord signatory countries. The engineering community must prepare for this eventuality by (1) technically qualifying Filipino engineers to work in overseas labor markets and (2) strengthening the local creation of jobs for engineers.

Given this scenario, it is clear that mutual recognition remains

Figure 5. Filipino Engineers Deployed Overseas by Region, 2010 (New Hires)



Source of basic data: www.poea.gov.ph

Source of basic data: www.poea.gov.ph

Table 3. Employment and Labor Productivity growth

	Average annual employment growth				Average annual labour productivity growth			
	2002–07	2008–11	2012–13	2014–16	2002–07	2008–11	2012–13	2014–16
WORLD	1.8	1.1	1.4	1.3	2.5	1.6	2.6	3.2
Developed Economies and EU	1.0	–0.3	0.4	0.6	1.4	0.5	1.5	2.0
CSEE (non-EU) and CIS	1.1	0.8	0.5	0.3	6.1	1.1	3.5	4.0
East Asia	1.2	0.6	0.6	0.3	8.6	7.8	7.5	8.1
South-East Asia and the Pacific	1.8	1.9	1.6	1.4	4.1	2.6	3.5	4.0
South Asia	2.2	1.0	2.0	1.9	5.4	6.1	4.8	5.4
Latin America and the Caribbean	2.5	1.9	1.8	1.7	1.4	1.0	1.7	1.8
Middle East	4.5	3.2	2.8	2.5	0.9	0.9	1.2	2.0
North Africa	3.4	2.0	2.2	2.3	1.4	1.8	0.8	2.8
Sub-Saharan Africa	3.1	2.8	3.0	3.0	2.5	1.5	2.3	1.9

Note: Based on *Trends econometric models* estimates; 2011 are preliminary estimates; 2012–13 and 2014–16 are preliminary projections. CSEE = Central and South-Eastern Europe.

Source: ILO, *Trends econometric models*, October 2011 (see Annex 4); World Bank, *World Development Indicators*, 2011.

Table 4. International Registries of Engineers

Register	Year Est.	Members	Operated by:
Euro Engineer	1987	26 European countries representing 2 million engineers	Fedracion Europeene d'Associations Nationales d'Ingenieurs (FEANI)
Asia-Pacific Economic Cooperation (APEC)	2000	APEC economies	APEC Engineer Coordinating Committee; Philippine Technological Council (PTC) for the Philippines
Association of Southeast Asian Nations (ASEAN)	1998	ASEAN countries	ASEAN Federation of Engineering Organizations (AFEO); PTC for the Philippines
ASEAN Chartered Professional Engineer Register (ACPER)	2005	ASEAN countries	**(ASEAN) PRC, PTC and CHED for the Philippines**
International Professional Engineers (IntPE)	2000	Canada, UK, US, Ireland, South Africa, Australia, NZ, HK, Japan, South Korea and Malaysia; FEANI has observer status	Engineers' Mobility Forum (EMF)

Source: Mapua TechServ, Inc. (for NAST Foundation, Inc.) (2006). Study of the Engineering Services and Outsourcing Sector. Manila: Department of Foreign Affairs, Republic of the Philippines.

> The Philippine framework for international higher education should have a logical goal of upgrading the quality of higher education rather than merely increasing participation in the open market of transnational education.

significant. In the short term, Filipino engineers and engineering technicians can continue to be employed in the country's traditional overseas market. In the long term, the government and PTC have to be more proactive in pursuing their application to the Washington Accord for managing future risks.

International Registries of Engineers

Several registries of engineers facilitate the mobility and cross-border practice of engineering talents (Table 4). Currently, there are few Filipino engineers actually registering in the APEC and ASEAN registries. With many engineers working abroad, the perceived benefits offered by the registries to engineers remain low and thus motivation to register is equally low. This remains a challenge for the PTC as the administrator of the country's registry.

Improving engineering education programs

The Philippine framework for international higher education should have a logical goal of upgrading the quality of higher education rather than merely increasing participation in the open market of transnational education. The 2006 Competitiveness Study on Education Services of the Philippines highlighted practices by institutions that do not redound to the benefit of the country. In light of this, two equally important themes—continuous quality improvement (CQI) and technology forecasting—come into focus.

CONTINUOUS QUALITY IMPROVEMENT

CQI strategies should be manifested in educational processes. An example of this practice is the engagement of Dr. Gloria Rogers in Outcomes-Based Education (OBE) as part of Mapúa Institute of Technology's Continuous Quality Improvement (CQI). The Institute already has acquired ABET accreditation in 10 of its engineering and computing programs. The learner-centered OBE focuses on "what a student learns and begins with consideration of what knowledge and skills the student will need to be successful after graduation." This shows that as part of Continuous Quality Improvement, educational institutions should periodically review and develop more efficient and effective CQI and OBE processes.

TECHNOLOGY FORECASTING

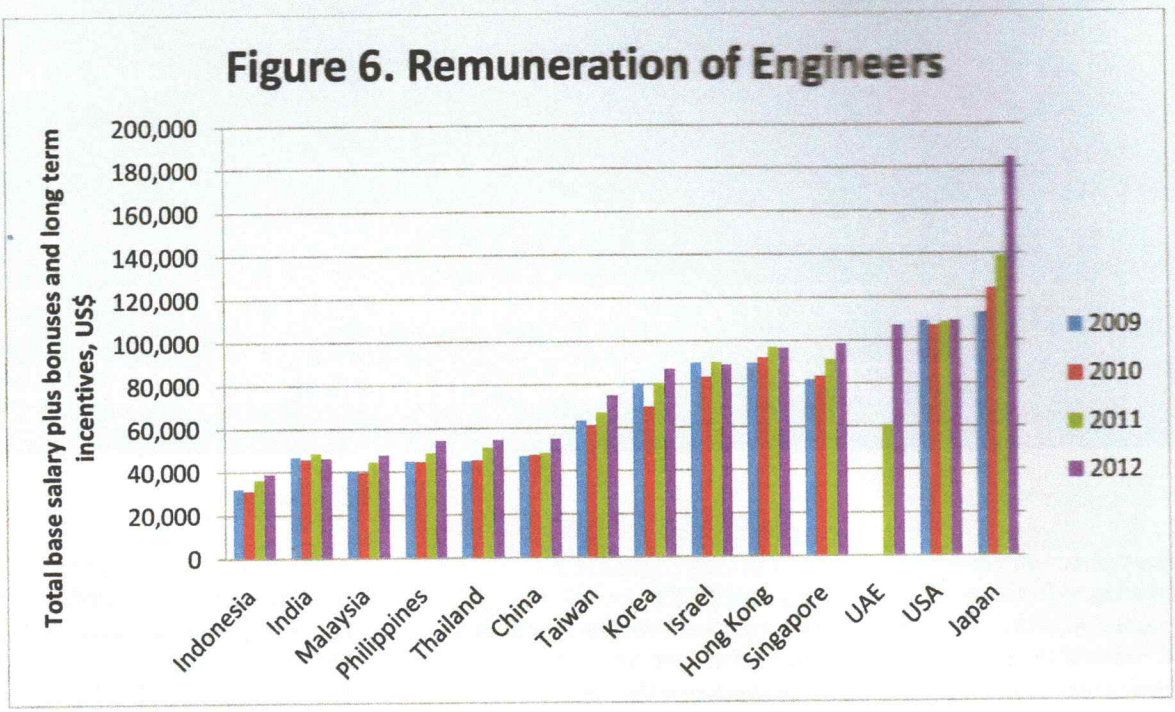
Another theme worth emphasizing is technology forecasting and its relevance, given the ever-changing landscape of the future and the chaos imperative induced by technology. In terms of proactive survival, technology forecasting is crucial—from corporate level strategies to formulations of R&D programs. However, its inherently high costs should not deter technology forecasting endeavors. Academic links with global networks, for example, Science & Technology Advisory Councils5 (STAC), could strengthen the viability of converting ideas into meaningful S&T-related industries. The most prominent of these local hubs is the SATC Silicon Valley Chapter.

Long-term concern: Creating engineers for development

Long-term challenges in engineering for the Philippines and ASEAN revolve around two themes: relevance and innovation. Making engineers relevant refers to shaping engineers for national and regional development. This entails keeping engineering talents within our embrace. On the other hand, developing innovators means honing engineers who are able to introduce new ways of doing things better. These two themes are interrelated, but pose different challenges.

Keeping engineering talents at home

Traditionally, the first factor cited for the exodus of talents is low compensation. Yet, total remuneration for engineers in the Philippines has been rising from US$41,000 in 2008 to US$54,370 in 2013 (Figure 6). This upward push in compensation, however, might be the market's response to the shortage of qualified engineers. Remuneration of engineers in rural areas is also rising due to competition from the BPO industry. This war for engineering talents is expected to intensify as other economies offer competitive compensations.



Source of basic data: IMD World Competitiveness Yearbook, 2009 to 2013

Generating engineering jobs locally

The lack of job opportunities is another plausible explanation for this technocratic diaspora. This poses the challenge of generating enough jobs for them at home. A 2005 study by McKinsey & Company reported that 52% of engineering jobs can be globally outsourced. This translates to opportunities for engineers to use their skills "overseas" while at home through engineering services.

As the Philippines continues to be battered by natural disasters, the engineering community must seriously respond to these problems. Philippine Institute of Civil Engineers (PICE) president and DPWH Undersecretary Romeo Momo has called on civil engineers in the country to be more "responsive and relevant" in finding solutions to these challenges. Engineering expertise in building resilient communities aligned with the Philippine Infrastructure Programs is of paramount importance.

But disaster risk reduction and management do not only concern civil engineers. There is also a need for more geodetic and sanitary engineers and other engineers concerned with disaster management. In 2013, however, graduates who took the examinations on these areas only represented about 2% of examinees with 60% passing rate.

Engineering developments to watch for

The country's emphasis on development entails consistent innovation and innovators. We are in need of engineers whose incubated ideas make efficient systems and improved processes of mankind.

Honing real engineers requires being attuned to emerging engineering developments and technologies. Part of the work of PTC and engineering professional organizations is to streamline these developments in engineering curricula. For instance, hydraulic fracturing or "fracking" and Services Science and Management Engineering (SSME) could be most relevant to the country. Engineers cannot afford to remain engineers in the traditional sense. An engineer has to be an innovator as well as a service innovator.

Conclusion

Southeast Asia's regional integration under the AEC in 2015 offers opportunities not only for new jobs but also for pressures to reform the engineering profession in the Philippines. The steady supply of engineers shows a gap based on the Philippine Development Plan 2011-2016 priorities—cause enough for concern in an increasingly mobile market that is fueled by the global war for talent. While improving the quality of engineering education is a desirable objective for professional engineering associations, it does not address the need for creating a vibrant economy that will generate the local demand for engineers and the incentive for these engineers to remain in the country. Here is where the leadership training programs must enter. Build the people first before building the infrastructure.