

THE PHILIPPINE ENGINEERING EDUCATION SYSTEM

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Abstract:

Due to the great influx of Philippine immigrants to North America it is of interest to local accrediting professional organizations to have a better understanding of the Philippine educational system. This paper describes the present state of Philippine higher education with specific emphasis on the engineering education process and some reference to technician education. The Philippines is a developing country in a painful state of transition with all the social, cultural and technological upheavals that are associated with such major changes. The cultural background coupled with an intense desire for education has created a unique situation where higher education is dominated by large number of privately-owned universities that are profit-oriented stock corporations. The proliferation of such "higher education establishments" (in a country of 45 million people with a general economic level much below western industrialized countries, there were - at last count, over 1000 universities with over 180 offering degrees in engineering) has greatly diluted available resources with the resulting reduction in the quality of education provided. The Philippine Government has recognized this very thorny problem and is trying to reorganize its entire engineering education system in a manner more appropriate to their needs. The Philippine case is singularly interesting as it is the only case of an entire system of technological education (in a country at that stage of development) being changed wilfully into a more "advanced and appropriate" mold.

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Background:

Violent political and military turmoil has kept South East Asian countries in the forefront of world interest for many years. In the post-war era, SEA has become a haven for many trans-national corporations and a source of low-cost labour for developing countries. In recent years we have been experiencing in North America a large influx of immigrants from SEA, many with higher academic training. As member of the Board of Examiners of the Association of Professional Engineers of Manitoba, Canada, the author has had in numerous cases to evaluate and pass judgment on the academic qualifications of Philippine immigrants, holders of B.Sc. degrees in engineering, who wished to qualify for registration as PE's. Since such considerations may be of interest to other professional licencing bodies, this paper tries to describe the system of technological education in the Philippines as researched by the author during 1980.

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The Republic of the Philippines and its cultural setting.

The Philippines is a South-East Asian archipelago of some 7,100 islands spread over a distance of more than 1,000 miles. The interior of many of the more remote islands is quite primitive and difficult of access. The country is naturally divided into three major areas. Luzon, the large northern island (well-known to Americans in WW2) is where the capital Manila and the economic and political heart of the country lies. The central isles of the Visayas are also fairly developed and still bear the influence of centuries of Spanish colonialism. In the south, the great island of Mindanao is the most primitive and is the seat of the Muslim population that is somewhat of a problem to the central government.

After many years of occupation, first by Spain and finally by the USA, the Philippines gained their independence by peaceful means after WW2. Its government that of a republic modeled after the US, with a Senate and a House of Representatives. (There is a general admiration for everything American although this adulation is diminishing recently with the increased insistence on recognition of Philippine culture and values). The executive power is vested in the President who, at the moment, in the words of President Ferdinand Marcos himself, is a "benevolent authoritarian". There have been recently some changes designed to shift the country to a more parliamentary government structure. Although there are some internal economic, political and religious/ethnic problems, the country is generally calm, stable and self-sufficient in terms of food.

There are in use 46 languages but one may identify Tagalog (40% of the population, mainly in the north) and Cebuano (30%, mainly in the Visayas) as the major ones. The country is officially bilingual in "Pilipino" (a version of Tagalog, the newly-designated national language) and English, and prides itself as being one of the largest English-speaking countries in the world. The fact that most education (except at lower levels) is still in English, makes the Filipino an immigrant very readily absorbable into the North American milieu.

Much of the industry (and education is a profit-oriented industry in the Philippines) is in the control of a few powerful families, some left over from colonial times and some having reached their pinnacle of power due to their closeness to the President and his family.

There are approximately 45 million Philipinos of whom more than two-thirds are under the age of 24. The typical Filipino is an extremely hard-working individual who has to overcome many social and economic obstacles simply in order to survive. The population sees its salvation in education and thus there is an unbelievable "drang" for higher education. The objective is social status and not necessarily the aquisition of useful knowledge. The spanish heritage has greatly lowered the prestige of any manual occupations. Everyone wants a degree, preferably a "Bachelor"! There is no status (social or financial) in being a technician or craftsman. Everyone wants to be an administrator

or, failing that, any other type of non-applied white-collar worker. This underlying national trait makes effective technical education appropriate to the developmental level of the country extremely difficult. Theory is accepted while practical laboratory and experimental work or research is shunned by students and teaching staff alike.

The government has recognized that the Philippines is passing out of the stage of being underdeveloped, into an intermediate "developing" level of industrial and technical achievement and is attempting through planning to prepare the necessary educational, industrial and economic infrastructure. At the same time it is trying to revitalize Philippine national consciousness with a concerted return to former linguistic and cultural values and thus eliminate the last vestiges of its colonial past.

General Philippine Education.

The educational system of the Philippines consists of a six year elementary level, a four-year secondary level, followed by a tertiary level of four or five years depending on the discipline studied. Engineering is typically a five-year program. The relatively short pre-tertiary education span causes serious difficulty at the tertiary level due to the poor preparation of the incoming students.

In contrast to the patterns prevailing in most countries we find that both public and private funding play important roles in the Philippine education system. It is instructive to compare the relative impact and importance of public and private funding: Public involvement is greatest at the elementary level while significant financial constraints and the powerful influence of the upper stratum of Philippine entrepreneurs have forced the government to nearly totally abdicate its responsibility at the tertiary level. Public schools serve 95% of all students at the elementary level, 45% at the secondary and only 10% at the tertiary level. Over one-quarter of the Philippine population is in school which is one of the highest enrolment ratios in the world. The national government increased educational appropriations by over 300% between 1967 and 1975 but the proportion of the national budget devoted to education has steadily declined from about 33% to less than 15% (This public expenditure of about 2.2% of GNP is extremely low and should be compared to that of Korea: 4.2%, Thailand: 3.6% and of Japan: 4.3%). About 60% of government expenditures are devoted to primary education, 10% to secondary and about 19% to tertiary with the remainder going to "overhead" and other institutions. The reverse is true for private establishments where 9% are allocated to primary, 33% to secondary and 58% to tertiary education.

Educational policies are formulated by the National Board of Education (often prompted by Presidential Decrees) and administered by the Department of Education and Culture (DEC). The DEC is responsible for the operation of public schools and non-chartered public colleges and for licencing and supervising private schools. There is a built-in discriminatory and preferential treatment of certain favourite chartered public establishments such

as the University of the Philippines (the official flagship of philippine tertiary education) that are allowed considerable autonomy which is sometimes abused with great arrogance.

Philippine Educational Priorities and Policies.

Present educational policies of the Philippines are mainly specified by the Educational Development Decree of 1972 (PD 6-A) based on findings of the 1970 Presidential Commission to Survey Philippine Education. The Act gives priority to the following objectives:

1. Improving instructional quality.
2. Equalizing educational priorities.
3. Strengthening the management of the DEC.
4. Strengthening middle level technical and agricultural training.
5. Restructuring higher education to align more closely to the country's goals and development needs.
6. Increasing the government's involvement in higher education.

It is to the credit of the government that several of these points have already been addressed. Ex: to upgrade academic standards generally, the government has instituted a National College Entrance Examination to achieve stricter promotion standards after the secondary level. It has also encouraged more diligent application of the present rather imprecise and voluntary "accreditation" standards that some school organizations have instituted. The restructuring of higher education and the broadening of the government's involvement in higher education has met severe obstacles of financial and political nature.

The Philippine system of higher education is extraordinarily large and diversified: at last count there were over 1000 institutions with an enrolment of about 1.2 million offering collegiate courses. The annual growth rate has been averaging close to 8%. Philippine enrolment ratios are the fifth highest in the world exceeded only by those of the USA, Sweden, Japan and New Zealand. 21% of the relevant 17-21 year age group are in post secondary schools. The largest concentration (45%) is in commercial or business courses and about 16% in liberal arts and science courses. The demand for technical training has been growing in recent years and about 18% of undergraduates are in this field. Geographically, 50% of the enrolment is concentrated in the Greater Manila area (a veritable megalopolis of universities), 18% in the rest of Luzon, 20% in the central Visayas and about 12% in Mindanao and the south.

Private institutions are divided into three categories: Sectarian schools (37%) sponsored by Catholic and Protestant Church groups; Non-Sectarian profit-oriented stock corporations (55%) and non-stock or non-profit institutions have about 8% of private enrolments. With the exception of some secular institutions that have had continuing though diminishing support from external sources, private schools are almost totally dependent upon student fees as a revenue source. Fees are very low and increases are

limited by the government to increases of less than 15% annually. As the fees do not completely cover the cost of education private establishments lose money on tertiary education operations. They do however make that up through significant operating surpluses generated by their primary and secondary education programs (the name of the game is: get as many bodies as possible to increase the fees intake). By their very nature, profit oriented establishments are more efficient in delivering their product assuming that a B.Sc. from one establishment is equivalent to that of any other. A comparison of average operating costs per student per year for private establishments reveals a figure of 1,485 pesos versus 2,044 pesos for the preferentially treated public University of the Philippines.

The Department of Education and Culture licences and reviews both the schools as institutions and each program and course that they offer. In fact many of the courses are specified by law as compulsory. The DEC has very substantial regulatory and statutory powers but has not been able to wield them effectively through a combination of lack of an effective evaluation means of college performance and severe shortages of qualified staff. Only one staff member is responsible for the review and licencing of all the universities offering engineering programs. The DEC has also been unsuccessful in convincing private colleges to shift their emphasis and resources into to fields of high national priority due to the high costs involved and due to the government's inability to assist with funding.

Some of the private schools have recognized the need to define and try to implement some sort of qualitative standards of educational performance and have formed two voluntary accrediting organizations, the Philippine Accrediting Association of Schools, Colleges and Universities (PAASCU) and the Philippine Association of Colleges and Universities (PACU). The former consists mainly of Catholic schools while the second is mainly a grouping of non-sectarian schools. Although these associations have served a useful purpose in raising the general level of awareness for the need for appropriate accreditation standards, they have lacked the authority and the resources to enforce such standards as they have evolved. A voluntary organization as such cannot force a private school member to make significant changes and expenditures that may be required to improve its educational performance when its paramount interest is centered on the "bottom line" of the annual report to stockholders.

The profit motive governing the majority of private educational establishments forces a concentration on non-capital-intensive programs (hence the proliferation of commerce and business administration programs and recently of a spectacular increase in industrial engineering or engineering management programs) with the consequent near total neglect of the infrastructure so basic to an applied engineering education system appropriate to Philippine conditions. It is much easier to concentrate on descriptions rather than spend considerable effort on improving content. This attitude is reinforced by the totally uncritical student body that accepts anything offered in imitation as the real thing.

has not been in use for many years regardless of the claim by educational administrators that all of their students use these labs regularly. The typical student is thus functional in some theories but totally unprepared for the application or use of measuring or control equipment. It is clearly the profit orientation of many of the private establishments that makes them disinterested in investments that do not bring immediate and direct increases in their revenues.

Teaching Staff and Administration.

There are nearly no engineering professors with PhD's and very few with MSc's. The only graduate program available for possible upgrading has until recently been at the University of the Philippines and was very poorly utilized. Recently several programs in Master of Engineering Education have been started in order to improve the capabilities of the teaching staff.

Teaching conditions are very poor and staff is grossly overloaded. The typical so-called full-time load is 24 'credit' hours per week with laboratory time (if any) counting as half time. Since the salaries are extremely low and uncompetitive the typical staff member cannot survive on this income and is thus forced to moonlight by taking on another teaching position (s) - possibly even full-time, across the street at the neighbouring university. This removes any dedication to any one institution or group of students and makes the delivery of an adequate instruction nearly impossible. It is of course futile to demand any "research" activities from such an overloaded staff. It is not to the advantage of the educational establishments to increase salaries as this affects their profits. As such it is not surprising at all to find that certain faculties of engineering experience yearly staff turnovers approaching 60%! As a result, there are very few full-time academics, most teaching staff being recruited usually on an ad-hoc basis from consultants and free-lancers. It is a common practice to hire a student who has just completed a course to teach the very same course during the next term to the following group of students. The teaching and "innovation" process becomes simply the transfer of old (often imprecise) notes from the new "teacher" to the "new" notes of the then-students. It is not surprising therefore to note a total lack of enthusiasm, dedication and interest to the academic process by administrators, staff as well as of the student body.

It is to credit of the isolated establishment or professor who endeavours to do the best possible in such a very trying environment. It is remarkable that innate intelligence and ambition of a certain proportion of students allows them to learn and eventually develop their own abilities and expertise in the application of what they have been taught.

General comments.

The engineering education system thus produces a large number of B.Sc. graduates of very poor calibre in terms of modern engineering knowledge. They are versed by rote in many of the theoretical aspects of the subject matter but are generally not exposed to practical knowledge nor problems of a "synthesis" or open-ended nature. The government recognizes the deficiencies

of the system and has instituted a series of "Professional Qualifying Examinations" designed to identify poorly qualified graduates. The pass rate on these examinations that each graduate must pass before he can practice as a Professional Engineer, has been averaging at just under 60%. The other 40% fall by the wayside and constitute a very expensive waste of educational effort and national resources. (It is of interest to note that the typical new graduate immediately enrolls into a "Professional Review" preparatory school, often run commercially by the very professors who taught him, to prepare him for the professional exams).

Another insidious waster of technological training is the gross underemployment of engineering graduates. The 1981 Engineering And Technical Manpower Survey of the Philippines notes that over 30% of graduates interviewed were employed at technician and even craftsman levels although their official job description and title included the term "engineer". Considering that the interviewers were recent and inexperienced engineering graduates whose lack of model of what constitutes true engineering activities would make their judgments err on the side of conservatism, it is reasonable to venture that the true proportion fo engineers working at lower level technical positions is probably much higher. It also points a major conclusion that there is a great demand for technologists and technicians that is at present not being satisfied by the educational system. The industrial establishment recognizes that need and the fact that "engineering" graduates often are not appropriately trained and as a consequence employs them in such technician positions. Industry also recognizes the philippine need for status recognition and thus bestows the description of "engineer" on these same positions. Table 1 indicates the realtive demands for "true" engineers and graduates of engineering. Both indicate a serious overproduction that shows no sign of abating.

Engineering Schools part of the Engineering Education Improvement Project.

As part of the Engineering Education Project of the Government of the Philippines (financed by a loan from the Asian Development Bank) twenty engineering universities distributed across the country have been identified as probably best suited for potential upgrading and development. Not all such universities have been included in this project. They include all the major and well established establishments in the major metropolitan centers as well as some smaller ones in more remote areas in order to serve the local population. They include one public institution, the University of the Philippines (which has several campuses) and 19 private ones, sectarian as well as private, profit-oriented institutions. Ten of these selected universities have been designated as "Resource" institutions due to their state of development and capability in serving as a future center of influence in their region. These institutions are identified by the letter "R" in the list presented in Table 3. It is reasonable to comment that the graduates in engineering from these institutions are probably the best qualified among products from philippine engineering schools. There are some engineering schools that are not part of this upgarding project that also can be counted among the top few institutions in the Philippines.

<u>University</u>	<u>Location (Region, City)</u>
University of the Philippines, UP, (R) (*)	Luzon, Manila
Mapua Institute of Technology, MIT, (R)	Luzon, Manila
De la Salle University, DLSU, (R)	Luzon, Manila
University of Santo Tomas, UST, (R)	Luzon, Manila
St. Louis University, SLU, (R)	Luzon, Baguio
Central Philippine University, CPU, (R)	Visayas, Iloilo
University of Negros Occidental-Rec., UNO-R, (R)	Visayas, Bacolod
Cebu Institute of Technology, CIT, (R)	Visayas, Cebu
University of San Carlos, USC, (R)	Visayas, Cebu
Silliman University, SU, (R)	Visayas, Dumaguete
University of the East, UE	Luzon, Manila
Far Eastern University, FEU	Luzon, Manila
Adamson University, AU	Luzon, Manila
University of Nueva Caceres, UNC	Luzon, Naga
Western Institute of Technology, WIT	Visayas, Iloilo
Divine Word University, DWU	Visayas, Tacloban
West Negros College, WNC	Visayas, Bacolod
Southwestern University, SWU	Visayas, Cebu
Notre Dame University, NDU	Mindanao, Cotabato
University of Mindanao, UM	Mindanao, Davao

Table 3: Philippine Engineering Universities part of the Engineering Education Development Project.

(*) (R) indicates an institution that is sufficiently developed to be selected as a "resource" institution for the area that it serves.

Note: there are about 160 other licenced engineering universities.

Conclusion:

This paper has attempted to describe in broad terms the system of engineering education presently in vigour in the Republic of the Philippines.

It points out that due to an extraordinary demand for higher education and the status that a university degree may bestow upon its holder there has resulted a proliferation of "engineering universities" of commercial and profit-oriented nature that really are not designed for the output of quality engineering graduates.

Even in the better engineering universities (refer to Table 3) the student is mainly taught by rote with little exposure to modern engineering knowledge, theory or practice. It is particularly in the practical aspects of engineering education (laboratory, experiments, techniques) that the major deficiency of the philippine engineering graduate lies.

It may be of practical value to professional licencing bodies in the USA and in Canada to become familiarized with the description provided by this paper.

It should be noted that the Philippine Government has instituted a concerted effort at upgrading and modernizing the engineering education system in the Philippines. It is also exploring alternatives to increase its possible input through better financing of engineering programs, particularly those of the private establishments that resent any imposition of outside controls. A new system of accreditation has recently been approved. It is based on a fairly rigid and simple listing of basic rules and requirements that must be followed by all engineering programs and is not based on the typical North-American "peer evaluation" system.

These changes will with time modify the present situation and the present comments will then have to be updated.

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