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A Case for the Legitimisation of Various Levels of Engineering Competences Under the Professional Engineering Registration Board (PERB) Act, Jamaica 1987*

Rae A. Davis
Gossett D.A. Oliver
University of Technology, Jamaica
237 Old Hope Road, Kingston 6, Jamaica

In this article, the authors examine the full range of the National Qualifications Framework that is being currently offered in Jamaica. Three *core level competences* are identified with their particular attributes and competences for registration under the Professional Engineering Registration Board (PERB). These are listed under a general heading of Levels 1-3. From the perspective of a developing country such as Jamaica, a model is suggested to achieve one harmonious system that integrates the different threshold standards of competences and commitments. The globalisation of pre-qualification for practice in the engineering profession through Standard Governance models, such as is currently established under the Washington Accord, is also examined in the article.

INTRODUCTION

All those involved in the recruitment, mentoring and training of young *budding* engineers need to be aware of the full range of engineering qualifications and their associated competences at the post secondary engineering education that are available in Jamaica. Post secondary engineering education as it now exists encompasses a number of different programmes, each having its own distinct roles and objectives.

In this article, post secondary education is used to encompass a follow up secondary education as opposed to tertiary education, which has a different meaning in Jamaica. It is the form of technical, vocational, professional or academic training made available to adults and young adults who have had the benefit of a primary and secondary education. In its broadest sense, post secondary education may be defined as the level of mastery of basic thinking, learning, communication and computational skills and knowledge of a body of general educational studies, which itself leads to a mastery of higher level competences in a particular discipline. For example, the National Tool and Engineering Institute (NTEI) offers three-year full-time Diploma Engineering type programmes, which are *thick sandwiched* with the workplace, that are not considered tertiary.

*A revised and expanded version of an Opening Address presented at the *8th UICEE Annual Conference on Engineering Education*, held in Kingston, Jamaica, from 7 to 11 February 2005.

Engineering Education for Professional Competence

With the progress of science and technology, planning for engineering education for professional competence is becoming more and more complex. Compared to professions such as law and medicine, engineering meets with several ambiguities that are not common to these other professions.

For example, law cannot be practiced by anyone other than persons who have legal education, generally at the first and second degree levels. Furthermore, there are no different levels of legal skill training at different institutional levels. This makes it easy to keep a close link between the profession and educational institutions.

In a similar way, the medical profession monitors and has intimate links with the medical educational institutions and, here again, no doctor can practice without having obtained a first or second degree from

a medical school. With the medical profession, all personnel who do not possess a medical degree are categorised as para-medical personnel and have the role to only support doctors.

In the case of the engineering profession, there is no such clear demarcation. Both professionals and non-professionals can practice engineering. Even within the educational structure, several levels of engineering qualifications, such as technician, technician-engineer, technologist, professional/chartered engineer and so on, exist and graduates from these different levels in practice often do interchangeable work. This results in confusion within the profession and causes ambiguity.

Further, each level of an educational institution generally trains more than one category of engineering personnel, adding more confusion [1]. Professional engineering societies have very nominal and loose linkages with educational institutions and, consequently, professional development and educational development take place often divorced from one another. This is the basic difficulty for suggesting clear-cut institutional structures for engineering education.

Systems Approach

Taking a systems approach in order to analyse the situation, the several sub-systems that form part of the overall educational system have components that are characterised by a considerable degree of fuzziness. Most educators are bewildered at this fuzziness, finding no easy ways to resolve the problem [2].

A further complication arises, partly due to historical development and partly due to the nature of the profession itself – the dichotomy between education and training. Many educational institutions consider training to be inferior and refuse to provide training courses. However, in the world of work, training is more valued than education, since those persons trained in a particular skill area can contribute more readily to a work environment than a broadly educated person.

Endless debates continue as to the proportion of training that educational programmes should contain and how such training should be provided. Arising out of this confusion, several types of programmes, such as cooperative, sandwich, short-term, post-degree, industrial internships, vacation work, etc, have all been trialed, but with no conclusive proof of any single method that demonstrates real success [3]. As a result of the above mentioned complexity, planning educational structures in engineering has to be very carefully approached so that the evolving future institutional structures takes into account these often diverse views so that they serve society better.

Nature of the Engineering Profession

Another important difference between the engineering and medical/legal professionals and the profession has to be appreciated in order to understand why an engineer cannot be similar to these professionals. The medical and legal professionals and profession always deal with human beings at the input-intermediate-output stages of their practice. The cause-effect relationships are clearly defined for a doctor/lawyer and it is one-to-one personal contact.

Since systems dealing with human beings are non-error tolerant, professional excellence and sensitivity to secondary effects can only be acquired by internships and, therefore, the medical/legal education systems are strongly dependent on this approach as the basis of educational development.

Unlike the above, engineers/technologists primarily deal with inert materials at the input-intermediate-output stages. This makes the profession somewhat insensitive to human concerns. In engineering/technology, the systems are generally error-tolerant, except in special safety related cases, and, as such, sensitivity to errors and secondary effects does not have as high a priority when dealing with inert materials systems. It also has a many-to-many impersonal casual relationship.

Engineers and engineering technicians have always worked as members of multidisciplinary teams that comprise individuals from several distinct levels. Yet increasingly, individual engineers and allied technician are being required to master new bodies of knowledge that are, in part, amalgams of the traditional engineering disciplines and, in part, new and beyond those traditional disciplines. In short, they are being required to be inclusive.

Inclusiveness recognises that engineering success requires competence and innovation at every stage of the engineering cycle; from research and development, through to design and manufacturing, and into operation and maintenance. An institution that welcomes all professionals, regardless of the stages of the engineering lifecycle in which they are engaged, is most likely to serve its members and society well.

The globalisation of engineering has brought about a worldwide flow of engineering knowledge. An essential role of a modern institution is to enable its members to both tap into and contribute to that knowledge flow, wherever in the world they may be, and to harness modern information and communication technologies to help them achieve it.

THE PRESENT SITUATION OF ENGINEERING EDUCATION IN JAMAICA

Two post secondary qualifications frameworks exist in Jamaica that include engineering qualifications: the National Qualifications Framework and the Technical Operating Model [4]. The latter was developed by the HEART Trust/NTA, while the Tertiary Qualifications Framework was developed by the Government of Jamaica [5]. Table 1 shows the typical delivery arrangements for programmes that fall under the National Qualifications Framework and the Technical Operating Model.

The National Qualifications Framework and the Technical Operating Model for employment qualifications in Jamaica points to the following elements listed below [4]. The framework was developed to describe how education and training services provided at all levels can seamlessly integrate the offerings of education and training institutions, and the needs of the labour market for worker competences into an effective, articulated and understandable design. National qualifications are intended to be inclusive and incorporate a variety of certificates, including both National Vocational Qualifications-Jamaica (NVQ-Js) and several tertiary certificates, as well as diplomas and degrees that are developed in accordance with the framework.

The framework includes National Vocational Qualifications (NVQs) at five different levels of skill, autonomy and responsibility that correspond to levels of employment and real jobs at different levels in the labour market. NVQs recognise and document the competences required to undertake the job at hand. These competences are defined in national industry standards describing competence involving the application of knowledge, skills and appropriate attitudes in the performance of work activities. These are called unit competence standards. Within a given industry, all the competences required for the functioning of the industry (or firm) can be defined according to the level of work activity described as follows:

- At Level 1, such work activities are categorised as routine and narrow and performed under relatively close supervision.
- At Level 2, activities are more varied, with some amount of individual responsibility and autonomy, plus possible collaboration with others.
- At Level 3, activities are complex, non-routine, and carry considerable responsibility and autonomy, as well as control or guidance of others.
- Level 4 work activities include a broad range of technical or professional activities with substantial personal responsibility and autonomy, responsibility for the work of others and for resource allocation.
- Level 5 activities stress significant responsibility, substantial personal autonomy and accountability for planning, execution and evaluation.

The unit competences defined by an industry include certain core skills that are needed by all workers (across all industries and sectors), skills needed by all workers in the particular industry, and skills needed to perform specific jobs and tasks. Industries can combine unit competences into qualifications they wish to recognise collectively, consistent with a set of

Table 1: Typical delivery arrangements for programmes that fall under the National Qualifications Framework and Technical Operating Model [4].

Level and Type	Secondary Schools	Technical & Vocational Education & Training	Enterprise-Based Training	Tertiary Education
Applied Degree				+
Undergraduate Diploma Associate Degree Certificate 4 NVQ-J Certificate 4		+	+	+
Diploma, Certificate 3, NVQ-J Certificate 3		+	+	+
NVQ-J Certificate 2	-	+	+	
NVQ-J Certificate 1	+	+	+	

Key:
+ Delivery arrangement for programmes under the model.
– No delivery arrangement for programmes under the model.

rules that ensures that a qualification has educational meaning. This is administered by the National Council on Technical and Vocational Education and Training (NCTVET), which is established under the HEART Trust Act – amended in 1994.

Table 2 lists the Tertiary Qualifications Framework.

The University Council of Jamaica makes the following points of the Tertiary Qualifications Framework [5]. The Tertiary Qualifications Framework seeks to provide a comprehensive, coherent, consistent yet flexible framework for the diversity of qualifications in the tertiary education and training system in Jamaica. The Framework presumes that programmes of study lead to specific qualifications and, therefore, does not include short courses undertaken for enhancement or enrichment purposes. The Framework provides a benchmark for commonly defined qualifications in the system.

Two broad categories of qualifications are identified within the Framework, namely:

- Qualifications that are academic in nature ranging from the Associate Degree through to Doctoral programmes;
- Qualifications that are vocational in nature, such as certificates and diplomas.

Table 2: The Tertiary Qualification Framework [5].

Qualification	Description	Minimum Entry Requirements	Duration (Full-time)	Minimum No. of Credits	Exceptions
Doctoral degree	Past Masters qualification; normally combines lectures, seminars, assessment and dissertation	Normally, Masters degree	Minimum 3 years	90	For persons with Bachelors minimum # of credits = 120+
Masters degree	Postgraduate qualification; normally combines lectures, assessment and project work	Normally Bachelors degree	Minimum 12 months	36	MPhil
Bachelors degree	Traditionally termed the first degree; denotes completion of university-level programme, 4 yrs beyond CXC.	5 O level or CXC passes in the required subjects or the equivalent	Normally 4 years	120	UWI: 3 yrs., A level entry requirement UWI/UTech engineering
Associate degree	Post-secondary qualification; normally year 1 & 2 of a 4-year Bachelors	5 O level or CXC passes in the required subjects or the equivalent	Normally 2 years	60	
Postgraduate diploma	Postgraduate qualification, vocational in nature, denoting competence in a specialised field	Relevant Bachelors degree or equivalent	Normally 1 year	30 (beyond the Bachelors)	Diploma in Tax Audit and Revenue Administration-MIND
Undergraduate diploma	Post-secondary qualification; may also be terminal. Differs from the Associate degree in that a larger proportion of the credits is assigned to the practical component	4 O level or CXC passes or the equivalent	Normally 2 years	60	Teachers Diploma: 3 yrs UTech Diploma: 3 yrs Edna Manley Diploma: 3 yrs (these diplomas may be ascribed up to 90 credits)
Certificate	First level qualification ranging from entry-level; usually vocational in nature, emphasising job entry-level skill development. May also be specialised qualification, acquired by persons who already have qualifications at a higher level. Normally, terminal qualification; may be assessed by institutions for acceptance to another level		Normally 1 year	30	Nursing Certificate: 3 yrs

These two categories of qualifications recognise different types of learning outcomes, reflecting the distinctive educational responsibilities of each type of programme. However, the distinction between the academic and the vocational is not always clear-cut, and recognition must be given to points of overlap between the two categories.

The Tertiary Qualifications Framework contains the main criteria for defining qualifications based on the general characteristics of education and training at each qualification level and in each category of qualification, thus providing a common ground for the award of qualifications by different institutions. However, at the same time, the Framework is intended to be flexible enough to respect institutional autonomy and creativity, preserve institutional diversity, and facilitate innovation. The principle of mutual recognition among institutions is at the core of the Tertiary Qualifications Framework. Therefore, the Framework recognises the existence of qualifications such as professional, technical and vocational, and other qualifications offered by Jamaican tertiary institutions that are not defined in the same way as those qualifications identified in the Framework.

STATUS OF THE CURRENT ENGINEERING TRAINING INSTITUTES

At present, international training plans are not developed. In fact, there is little formal planning by any of the institutions that are currently involved in engineering training. Although institutions have developed annual budget requests that provide details on how resources will be expected within the specified fiscal period, few plan fiscally or programmatically and few coordinate with other sectors.

The Government's interagency coordinative responsibilities and national training priorities are rarely entertained in developing budgets and programme progression. What is obtained currently is fragmented instead of a cohesive engineering administrative structure.

The major administrative entities are the Human Employment and Resource Training (HEART)/Trust/ National Training Agency (NTA) – HEART Trust/ NTA, the Technical Vocational unit in the Ministry of Education, Youth and Culture (MEYC), the Tertiary unit in the MEYC (See Table 3).

Table 3: Administrative units and associated engineering programmes.

Administrative Units	Programmes
Ministry of Education Youth & Culture	
1. Technical vocational units	Technical high schools Vocational programmes
2. Tertiary units	University of the West Indies University of Technology, Jamaica Community colleges Vocational training and development unit
3. *HEART Trust/NTA	Jamaican & German Automotive Schools (JAGAS) National Tool and Engineering Institute (NTEI) Apprenticeship Board
4. Private	Nothern Caribbean University (NCU) Vector Technology Institute (VTI) University College of the Caribbean (UCC) Caribbean Polytechnical Institute (CPI), etc.

THE JAMAICAN INSTITUTION OF ENGINEERS (JIE)

In its present form, the Jamaican Institution of Engineers (JIE) has been in existence since 1977. The JIE exists as a learned society; the main objectives of the JIE are the advancement of engineering knowledge, the promotion and maintenance of high standards of work in the engineering field and to promote the recognition of the engineer's importance to the welfare of every community. In 1988, the JIE established the Jamaican Institution of Engineers Foundation as a non-profit organisation by its members for the purpose of catering to the continuing education, training needs and professional development of graduate and professional engineers.

There are six classes of membership that are divided into two categories. Membership includes: Fellows (F), Life Members (LM), Members (M), Graduate Members (GM), Affiliate Members (AM) and Student Members (SM). As stated in the Constitution of the JIE, the basic requirements for membership are listed in Table 4.

One of the major achievements of the JIE has been the role played in the institution of legal registration of engineers under the Professional Engineering Registration Board (PERB) Act of 1987.

The existence of a registration law will, no doubt, have a major impact on the institution. In the past, membership to the institution was considered *de facto* registration. Some engineers may, indeed, be interested only in the professional status and not in the learned

Table 4: Basic requirements for membership in the JIE.

Members	A degree, Diploma, or other award, from an institution with an approved course of engineering studies, together with four years of approved experience.
Fellows	Members who are distinguished by their work in engineering.
Life Members	Members who are aged 65 years and over who have been Corporate Members for 15 years or more.
Graduate Members	As for members, excluding the experience requirements.
Affiliated Members	Engaged in the Engineering and Construction industry, or related academic areas, and hold a degree, diploma or an award in the science.
Student Members	Enrolment at an approved institution or learning organisation.

society and other developmental activities of the institution. The JIE will have to respond to these new challenges. No doubt, there will be many other challenges, especially in education and training codes and standards.

The Professional Recognition of Engineering Qualifications

The Professional Engineers Registration Board (PERB) is the body charged under the Professional Engineers Registration Act (PERA) of 1987 with the responsibility for the registration of professional engineers and for regulating the practice of engineering in Jamaica. The PERB currently falls under the portfolio of the Minister of Transport and Works.

There are over 400 individuals and 80 engineering organisations registered with PERB in one or more of the 15 Categories under which they may be registered to practise engineering. Of these total figures, 54 individuals and two firms were approved during the period April 2003 to April 2004 [6].

In Jamaica, registration is compulsory for all persons, firms and organisations wishing to offer engineering services to the public. To become registered, the Act requires that applicants must be:

1. Citizens of Jamaica or ordinarily a resident of Jamaica;
2. Of good character and reputation;
3. Members of, or hold a certificate granted by, an accredited institution or other body recognised by the Board as having competence to approve qualifications as an engineer in a category of engineering work; or
4. Hold a certificate recognised by the Board indicating competence in some category of engineering science.

In addition, they must have at least two years of approved post-qualification practical experience in that category of engineering work (at least one year of which must be in Jamaica). They must also have passed such examinations as may be required by the Board.

An engineer visiting Jamaica to work temporarily on a specific project must obtain temporary registration.

Therefore, it is the responsibility of the PERB to determine the factors that will recognise certificates that have been *granted by an accredited institution*. The Engineering Programmes Accreditation Committee (EPAC) has its origin from the Jamaica Institution of Engineers/Professional Engineers Registration Board/Canadian Society of Civil Engineering (JIE/PERB/CSCE) Accreditation/Registration Project, a five-year project that was initially funded under the auspices of the Canadian International Development Agency (CIDA) for the purpose of enhancing PERB's engineering registration system. Also, it was recognised that, since there was neither an accreditation process, nor an examination procedure, in place, it was important to develop more defined academic and experience requirements.

The Project proposed the establishment of several committees, one of which was the EPAC, a standing committee of PERB. The EPAC would accredit programmes primarily at the two main universities in the region.

CORE STANDARDS OF COMPETENCES

The Jamaican economy depends upon improved business performance, which in turn relies, to a great extent, on the competence of Jamaican professionals. Jamaica has a proud engineering heritage but, in an increasingly competitive world, this engineering competence must reflect the needs of business and industry for astute and experienced creators and managers of technology.

In the engineering environment, this requires that engineers and technicians work together in a seamless arrangement. Engineers and technicians also have a more important role than ever, as technology and industry/societal demands become increasingly complex, in ensuring that development takes place in a way that does not cause problems for people's safety or health. They have an equally crucial part to play in minimising risk to the environment and in bringing about

sustainable development.

The above suggests that Jamaica has distilled in these standards the framework of capabilities expected from competent engineers and technicians. With the establishment of the HEART/NTA, the PERB and the UCJ, Jamaica has the means to nurture and develop the skills and know-how for the adoption of a system of easily readable and comparable engineering qualifications, also through the implementation of harmonious national engineering registration. In analysing the present levels of the engineering profession as outlined above, three levels of core standards of competences are evident; these are listed below.

Level 1:

- Use a combination of general and specialist engineering knowledge and understanding to optimise the application of existing and emerging technologies;
- Apply appropriate theoretical solutions to engineering problems;
- Provide technical and commercial leadership;
- Demonstrate effective interpersonal skills.

Level 2:

- Use a combination of general and specialist engineering knowledge and understanding to apply existing and emerging technologies;
- Apply appropriate theoretical and practical methods to design, develop, manufacture, construct, commission, operate and maintain engineering products, processes, systems and services;
- Provide technical and commercial management skills;
- Demonstrate a personal commitment to professional standards, recognising obligations to society, the profession and the environment.

Level 3:

- Use engineering knowledge and understanding to apply technical and practical skills;
- Contribute to the design, development, manufacturing, construction, commission, operation or maintenance of products, equipment, processes, systems or services;
- Accept and exercise personal responsibility;
- Make a personal commitment to an appropriate Code of Professional Conduct, recognising obligations to society, the profession and the environment.

A PROPOSED MODEL TO HOMOGENISE THE ENGINEERING PROFESSION IN JAMAICA

At present, there are four main bodies in Jamaica that are involved in regulating the engineering profession in Jamaica, namely: the PERB, UCJ, NCTVET and the Electrical Licensing Board (ELB). At the same time, based on the profile of the profession, there are gaps. As the country strives to improve the quality of its workforce, the State has to ensure that the system operates in the most efficient way and, at the same time, adjust to the new international benchmarks for the engineering profession. Therefore, it is important that the model depicts and recognises excellence and mesh engineering education and training in one harmonious system that integrates different and parallel routes in the formation process of the various levels of the engineering profession. The proposed generic model is shown schematically in Figure 1, while Figures 2-4 show the requirements and routes to membership and registration at the three levels.

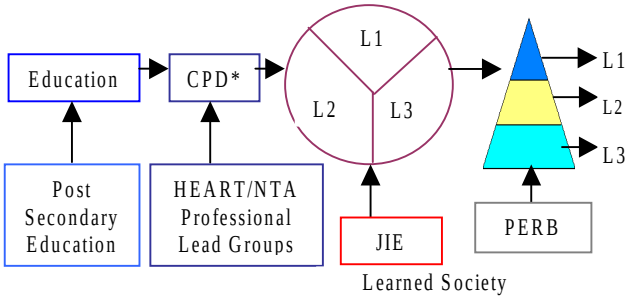

Figure 1: Schematic presentation of a proposed model to integrate various levels of the engineering profession.

A GLOBAL PERSPECTIVE ON THE FORMATION OF THE PROFESSIONAL ENGINEER

An increasing number of countries formally recognise the standing of all levels of the engineering profession in a harmonious way under a single registration management.

In the United Kingdom, the Engineering Council UK is responsible to register all cadre of engineers: Chartered Engineer, Incorporated Engineers and Technicians. Table 5 shows the qualifications framework and links to professional qualifications.

The Australian model, under the auspices of Engineers Australia, gives Chartered status to the three levels: Chartered Professional Engineer (CPEng), Chartered Engineering Technologist (CEngT) and Chartered Engineering Officer (CEngO) [8].

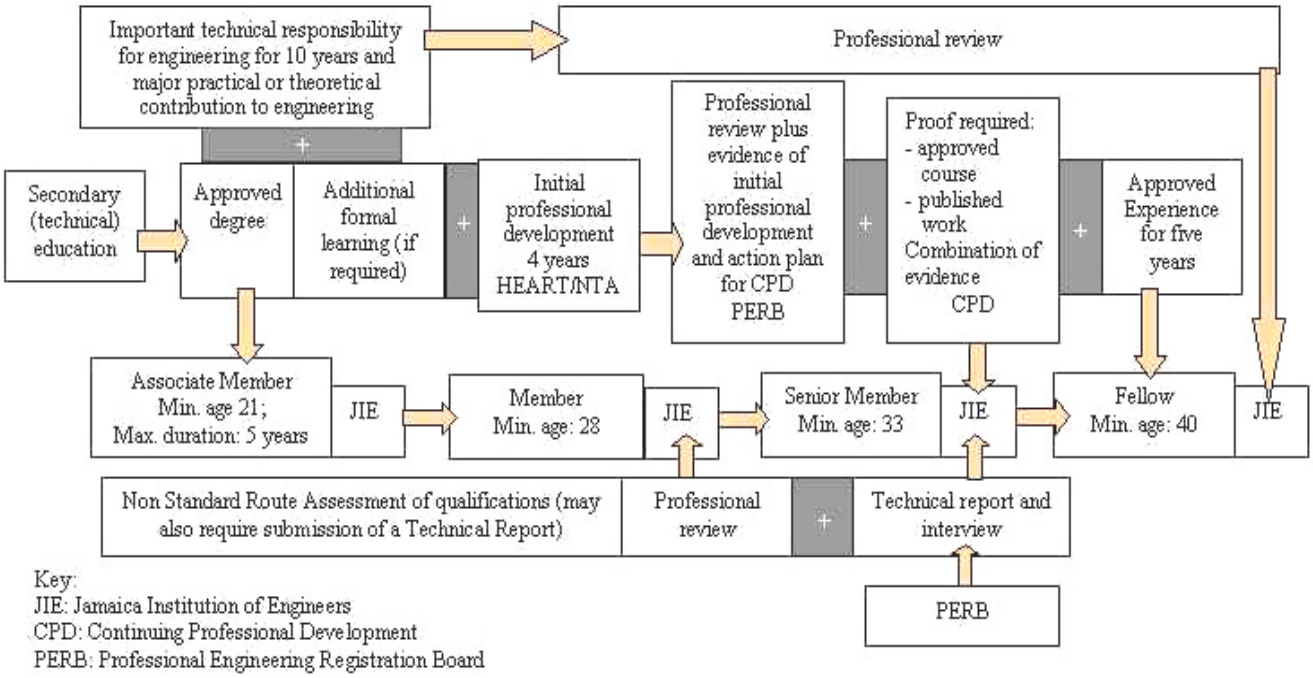

Figure 2: Routes to Level 1 membership registration – the JIE and the PERB.

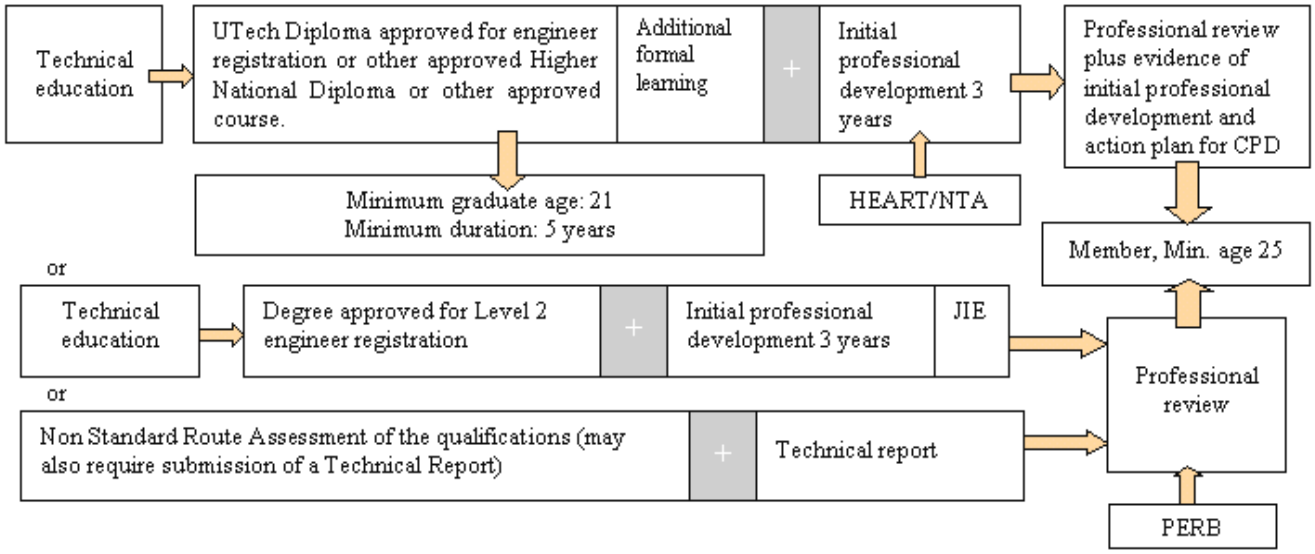

Figure 3: Level 2 membership registration – the JIE and the PERB.

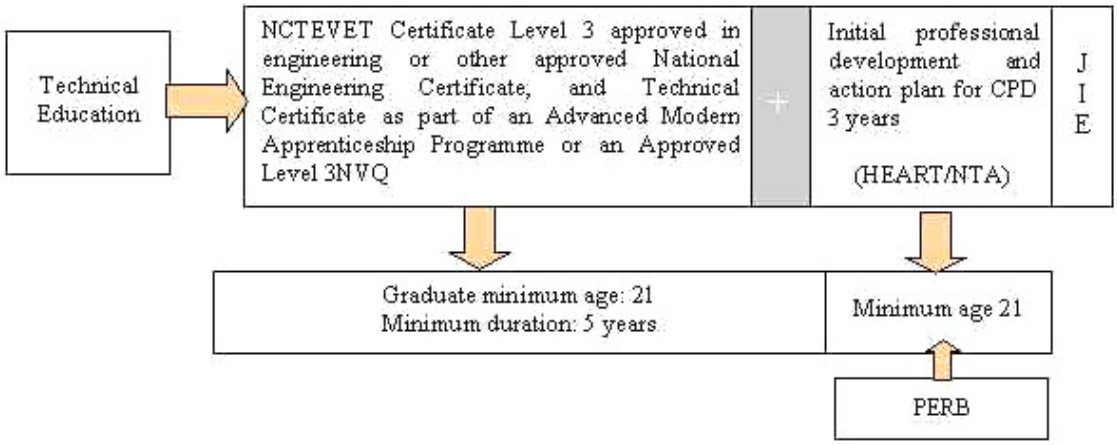

Figure 4: Level 3 membership registration – the JIE and the PERB.

Table 5: Higher level qualifications framework and links to professional qualifications [7].

Level	Qualifications*	Link to the Register of Professional Engineers
1	Certificates of Higher Education	
2	FDs, ordinary (Batchelor) degrees, higher diplomas	Engineering Technician, Eng Tech
3	Beng(Hons), Graduate Diplomas	Incorporated Engineer, IEng
4	Masters degree, postgraduate certificates/diplomas	Chartered Engineer, CEng
5	Doctorates	

International arrangements to facilitate the cross-border mobility of professional engineers are becoming commonplace. For this purpose, the Washington Accord signatories have agreed on mutual recognition for engineers of basic educational qualifications. Where economies operate both multilateral registers, there must be a commitment to maintaining equivalence and the PERB will be required to operate in this way.

CONCLUSION

The proposal to move towards a unified registration system has many merits, as follows:

- Through accreditation, membership qualifications, experience and insurance status is aligned to the development of the country.
- The PERB would enforce current work on legal liability reform at all professional engineering levels.
- The integrity of the registration system is sustained where applicants expect to be assessed against objective competence standards that take account of their knowledge and understanding, as well as their workplace activities, in a way that is both visible and defensible.
- Members of the PERB undertake to be bound by the PERB's Code of Ethics and the disciplinary regulations that underpin it. All registrants are required to practice only within the limits of their competence and to maintain records of their continuing professional development for audit purposes.
- Public safety is protected when only competent practitioners are registered to provide engineering services in critical areas. Registered practitioners are engaged to provide services in such areas only if stipulated by regulations or demanded by the market.
- Information imbalances are reduced when registration standards are made available. Published information must express the observable functions that are necessary in order to practice competently in each area of the register in terms of competence-base eligibility criteria.
- In some instances, regulatory schemes are utilised when governments find a need to place aspects of practice under the law. This is usually carried out because the government has assessed that practice by unqualified or inadequately experienced or uninsured practitioners in such areas puts the community at greater risk than the constraints on competition associated with registration.

Furthermore, the duration required to obtain level 3 professional engineering status in Jamaica requires upward adjustment to be synchronised with international practice (see Figure 5).

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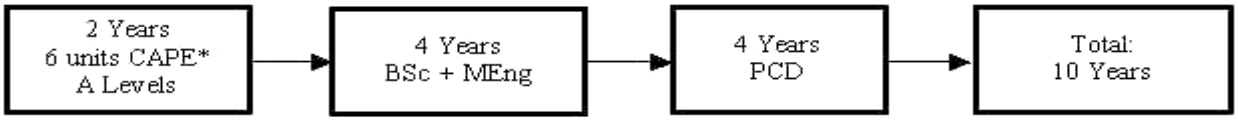

Figure 5: Schematic diagram showing the projected minimum duration expected by an aspirant to become a Chartered Engineer (Note: CAPE = Caribbean Advance Proficiency Examination).

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BIOGRAPHIES

Dr Rae Anthony Davis assumed the duties of being the President of the University of Technology, Jamaica (UTech), Kingston, Jamaica, on August 1, 1996.

He began his career as an educator at his *alma mater* Clarendon College and then at Excelsior High School. He lectured in electrical engineering at the University of the West Indies, St Augustine campus, between 1972 and 1975, before joining the College of Arts, Science and Technology (CAST) in 1975 as Head of the Engineering Department.

From 1979 to 1989, Dr Davis held the positions of Training Manager, Staff Engineering Manager and Vice President, Management Services at the Jamaica Telephone Company (now Cable and Wireless, Jamaica). In 1989, he joined the Ministry of Education as an Advisor/Consultant and became the Permanent Secretary in 1990. In 1993, he assumed responsibility as the National Co-ordinator for the Reform of Secondary Education (ROSE) project.

Dr Davis has a BSc in special physics from the University of the West Indies, Master's and Doctorate degrees in electrical engineering from Loughborough University in the UK, and a Master's degree in applied behavioural sciences from Johns Hopkins University in the USA.

He has held leadership positions in several national, regional and international organisations, including the President of the Jamaica Institution of Engineers (JIE); President of the Jamaican Society of Scientists and Technologists, Vice President of the Inter American Science Association (Intercienca) and member of the Executive Board of the Association of Commonwealth Universities. He is a founding member of the Jamaica Association of Training and Development, a Fellow of the Jamaica Institution of Engineers and a Member of the Jamaican Institute of Management.

He has received several citations and honours including the national award of Order of Distinction, Commander Class. He was also awarded the UICEE Silver Badge of Honour in February 2005.

Dr Davis is currently Chairman of the National Council for Technical and Vocational Education and Training; Vice Chairman of the HEART Trust/National Training Agency and is a member of the boards of the Caribbean Examinations Council and the University Council of Jamaica.

Dr Gossett Dunn A. Oliver was appointed the Dean for the Faculty of Engineering and Computing at the University of Technology, Jamaica (UTech), Kingston, Jamaica, in September 1998 and has continued to hold this position.

His career as an engineering educator commenced as early as 1970 when he was appointed lecturer in the Mechanical Engineering Department at Kilburn Polytechnic, London, England, UK. During 1978-1981, he was seconded by the United Kingdom Government under the TETCO programme to develop the Higher National Diploma (HND) course in production engineering at Kaduna Polytechnic Nigeria. In 1981, he was appointed Head, Engineering Department, College of Arts Science and Technology, Jamaica. He remained in that position until 1987, when he began his own Engineering Consulting Firm.

His industrial experience spans a vast range of industries including: Managing Director, Gossett Oliver & Associates Consulting Firm (1988-1993), Project Manager, IDB/GOJ primary education Improvement Programme (1993-1995), and Maintenance Manager, IDB/GOJ Health Services Rationalisation Project (HSRP) (1995-1997).

He has served in leadership positions on several national and international Boards and Committees including: Chairman of the University Council of Jamaica Engineering Board; Chairman of the National Non-destructive Committee at the Jamaica Bureau of Standards under the UNDP-RLA8/005 Regional NDT Project, Past Vice President of the Jamaica Institution of Engineers (JIE), and Past Publications Chairman and Council Member of the Jamaica Institute of Engineers.

Dr Oliver earned a Doctorate degree in metallurgical engineering at Brunel University, England, UK, a Master's degree in metallurgy and quality control also from Brunel University, as well as a Bachelor in Metallurgy and Materials at the City London

Polytechnic, London, England, UK, and a full Technological Certificate in Production Engineering from the City and Guilds of London Institute. He is a Chartered Engineer (CEng UK), and a Senior Member of the Welding Institute (SenMWeldI). He is also an active researcher and publisher in the field of tribology and engineering education.

He has received numerous awards and recognitions including the President's Research Incentive Award in recognition of research at the University of Technology, Jamaica, the Kiroskar Pumps Award in recognition of engineering development in the sugar industry in Jamaica, the University Council of Jamaica Award in recognition of invaluable contribution to the development of standards of engineering, and the UICEE Silver Badge of Honour for distinguished contributions to engineering education. He is also an honorary member of the CGLI.

Dr Oliver has written a combined total of 47 manuals, publications and professional presentations.

Conference Proceedings of the *8th UICEE Annual Conference on Engineering Education* under the theme: *Bringing Engineering Educators Together*

edited by Zenon J. Pudlowski

The *8th UICEE Annual Conference on Engineering Education*, held under the theme of *Bringing Engineering Educators Together*, was organised by the UNESCO International Centre for Engineering Education (UICEE) and was staged in Kingston, Jamaica, between 7 and 11 February 2005, with the University of Technology Jamaica (UTech) as the host and principal co-sponsor.

This volume of Proceedings includes a range of diverse papers submitted to this Conference that detail various international approaches to engineering education research and development related to the Conference theme, as well as other specific activities.

The 76 published papers from authors representing 25 countries offer an exemplary collection that address fundamental issues, concepts and achievements of individual researchers. The papers have been organised into the following groups:

- Opening and Keynote addresses
- Case studies
- Conceiving designing implementing operating: CDIO initiative
- Effective methods in engineering education
- Important issues and challenges in engineering education
- Innovation and alternatives in engineering education
- International examples of engineering education and training
- Multimedia and the Internet in engineering education
- New trends and approaches to engineering education
- Quality issues and improvements in engineering education
- Research and development activities in engineering education in Jamaica
- Specific engineering education programmes

It is significant to note that, as well as the international input into the Conference, contributions have come from academics representing the University of Technology Jamaica (UTech), as well as from authors focusing on the CDIO initiative. The variation of subjects, concepts, ideas and international backgrounds in this volume of Proceedings demonstrate the global nature of UICEE-run Conferences, as well as its relevance within the worldwide affairs concerning engineering and technology education.

In order to ensure the high quality and value of the Proceedings into the future, all of the papers have undergone assessment by independent international peer referees and have been professionally edited. As such, it is envisaged that this volume will become a useful source of information on research and development activities in engineering and technology education within the context of a collaborative engineering education environment.

In order to purchase a copy of the Proceedings, a cheque for $A100 (+ $A10 for postage within Australia, and $A20 for overseas postage) should be made payable to Monash University - UICEE, and sent to: Administrative Officer, UICEE, Faculty of Engineering, Monash University, Clayton, Victoria 3800, Australia. Tel: +61 3 990-54977 Fax: +61 3 990-51547

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