CONTINUING PROFESSIONAL DEVELOPMENT - A REQUIREMENT FOR PROFESSIONAL ENGINEERS

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INTRODUCTION

Traditionally, there are three specific aspects of training and continuing development which are recognised as being essential for ensuring competence in the practice of any profession. These are Formal Education (in the principles and fundamentals of the profession), Structured Training and Continuing Professional Development (CPD). The Formal Education is traditionally provided by an undergraduate degree programme at a university. Structured Training relates to the apprenticeship which graduates are required to undergo before they may be considered suitably qualified to hang out their shingles and enter into the practice of the profession. Having completed this apprenticeship, however, it is important for the practitioner not to remain static, but to continue to aggressively monitor developments in his particular field in order to ensure that he remains up-to-date. This third aspect is referred to as Continuing Professional Development.

While these elements of education and training are equally important in the development of the professional, this paper focuses on the third, continuing professional development, since this is the one which is least structured, least monitored, and for which least guidance is available for the individual professional. This issue has been receiving much attention by engineering institutions and licensing agencies across the globe in recent years. One major question which is being addressed is whether CPD should be a mandatory requirement for membership of engineering institutions and for licensing purposes.

EDUCATION AND TRAINING OF THE ENGINEER

Formal Education

The undergraduate degree programme is the first formal element in the education and training of a professional. At this stage, the basic principles are taught and learned. Students are drilled in the technical aspects of their chosen profession and the intellectual tools are developed and honed. This is the foundation on which all the further education, training and experience must rest in order to create a competent professional. While there is considerable variation in the content and approach to this element, it is typically regulated by an accreditation process which seeks to ensure that a certain minimum standard of professional education is achieved within the institution. This is generally a prerequisite for graduates being considered for acceptance into the profession by the professional institutions.

Structured Training

The Structured Training programme is intended to provide a transition between the academic formal education programme and the practical real-world environment in which professionals operate. This programme should be designed to ensure that the graduate is exposed to all the key sub-disciplines within his main discipline. It is conducted ideally with a mentor, whose role is to ensure that the graduate is exposed to proper accepted professional practice in the main areas, and that he has a full awareness of and a commitment to the ethics of the profession. In the medical profession, for example, this is the formal internship programme which is considered an essential part of the training of a medical doctor. During this period, interns are exposed to a wide variety of cases, and have the opportunity to practise their diagnostic and prescriptive skills under the guidance of more experienced practitioners. Similarly, engineering graduates are generally expected to undergo a training period of approximately four years before becoming

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entitled to register as professional engineers, often following a suitable professional examination.

Continuing Professional Development

From the moment he begins professional practice, the engineer begins to acquire new knowledge and experience. The experience comes directly from being involved in actual projects and having to develop appropriate solutions for real problems in the real world. In the course of doing this work, the engineer will need to process a considerable amount of information and literature. This will include, but will not be limited to, product literature, technical material and management information. He will also be exposed to formal and informal on-the-job training. All of this will be encountered as a normal part of his job, and will generally require little initiative on his part.

Outside of this routine on-the-job development, the engineer will need occasionally to step back from the day-to-day demands of the job, to examine the developments in his field, to consider his own career ambitions and expectations and in the light of these considerations, to develop specific career development plans. In pursuance of these plans, he is encouraged to develop a CPD programme aimed at achieving his career objectives.

The engineering institutions across the globe have generally paid considerable attention to formal education and structured training and while they have publicly recognised the importance of continuing professional development, and have been at the forefront of providing opportunities for professional development, they have usually not been prescriptive in requiring participation by their members in CPD activities.

THE RATIONALE FOR CPD

In the light of what has been described as a technological explosion, much of the current literature on continuing professional development refers to the half life of the degree programme in the career of the engineer. The literature suggests that this half life has reduced from 10 or 20 years a decade or two ago to a current value of three to five years. In the light of this trend, Pennoni[1] discusses the relevance of mandatory Continuing Professional Development for relicensing of engineers.

It would be useful to explore this analogy with radioactivity. A five-year half life implies that the engineer, if he does nothing to improve his knowledge within five years of graduating, is only half as effective as he was on graduation. It therefore implies that, in order to regain his full effectiveness, he needs to add to his depleted store half as much as he had accumulated up to graduation. Every three to five years thereafter, he needs to cover an equivalent of half of his original degree programme simply to maintain his graduation effectiveness. In the context of the individual attempting to maintain currency in his discipline, this is an overwhelming thought.

While the half life model is useful in providing a dramatic illustration of the critical need to keep working at remaining up-to-date, some elements of the model may be unsatisfactory. In particular, it does not highlight the critical importance of the foundation which is laid in the formal education phase, and upon which all else is built. Further, it does not reflect the maturing of the engineer as he consolidates formal education with engineering practice, nor does it capture the ever-increasing scope and competence of the diligent practitioner as he broadens his experience and develops new professional skills. Finally, it does not recognise that, as the engineer gathers experience and consolidates his theoretical understanding of his particular field, it becomes progressively easier to add to the existing structure and to fill in the voids in his ever-widening sphere of competence.

On the other hand, there is no denying that the engineering student of today is being exposed to facets of engineering science and technology which are a world apart from those which his predecessors learned about in the classroom even a decade ago. It requires considerable drive and initiative for the engineer in mid-career to commit himself to making the effort to acquire equivalent skills in these new areas. Failure to do so, however, relegates him to early obsolesence; this in itself should provide the incentive for him to commit himself to this endeavour.

THE EXPERIENCE IN THE CARIBBEAN REGION

The Engineering Faculty of The University of the West Indies has been in existence since 1961. From modest beginnings, the Faculty has grown significantly over the last 35 years and has established a tradition of excellence. Registration fees have been nominal for

contributing territories, and while there have been substantial increases in recent years, an engineering education is still accessible to citizens of these countries who meet matriculation standards.

At present, all the undergraduate degree programmes in the Faculty are accredited by the British institutions. It can be argued that this provides an objective test of the quality of the degree. By extension, without undue complacency, it can be argued that the quality of the formal engineering education available to the peoples of the region is of an acceptable standard.

Upon graduation, one of the realities faced by engineers practising in the Caribbean is that there is limited opportunity for varied and sophisticated engineering practice. The engineering communities in these islands are very small and this has an implication for the opportunities for meaningful exchange of experiences. Of equal importance, many engineers upon graduation find themselves employed by small organisations in which there may be few other engineers, and often none within their particular discipline. For one thing, this creates difficulty in implementing a suitable structured training programme. For another, it limits the scope for the sharing of ideas and for technical review of engineering work. Under these circumstances, it is considerably more difficult for these engineers to develop the professional discipline and standards which their counterparts in more sophisticated countries are forced to develop.

Furthermore, in many of the islands, engineers do not have ready access to seminars, workshops and courses in technical areas. The organisations usually have severely limited resources, and are often unable or unwilling to finance regular overseas training for their staff. In addition, they are often so dependent on the few professional staff that it may be difficult to release them for any length of time. The result is that these engineers often do not have ample opportunity for training and upgrading, and as a consequence, fail to live up to their full potential. The tragedy is that these are precisely the engineers who most need the training opportunities, and these are the organisations which can least afford not to allow their professional staff to develop their full potential.

On the other side of the coin, many engineers in these circumstances find themselves thrown in at the deep end very early in their careers. At a tender age, they assume levels of responsibility which their counterparts in the more developed countries have to wait much longer to enjoy. Some engineers possess the drive and the initiative to profit from this opportunity and to quickly develop the skills and gain valuable experience. Many become seduced by the position and fail to realise when they lack the necessary skills and experience to perform their jobs competently. These engineers are at risk of developing life-long habits of bad engineering and management practice, and implementing inappropriate systems and procedures, which if left unchecked can become the standards by which future engineers entering in these organisations are judged.

The upshot is that competence and professionalism are not always the norm in the profession. This leads to a loss of respect for the profession, which, if followed to its conclusion by employers, planners and decision-makers, deprives the profession of its rightful position of influence in the society, deprives the wider society of the contribution of the engineering profession and can initiate a vicious spiral of incompetence and impotence within the profession. When we, in this region complain of a lack of respect for and appreciation of the role of the engineer in the society, we may be seeing the result of inadequate post-graduation training and continuing professional development of our engineers.

The engineering community needs to recognise that the solution to these problems lies within its hands, and the duty and responsibility to act decisively to restore the profession to its rightful place lies on its doorstep. It is imperative for the engineering community in the region to join the discussion which is taking place around the world today, and to join the movement for increased activity in the areas of structured training and continuing professional development.

THE CPD INITIATIVE IN TRINIDAD AND TOBAGO

Over the last few years, there has been renewed interest in continuing professional development worldwide. The British and American institutions have been busy putting CPD programmes in place. It is interesting to note that many institutions, after careful deliberation, have opted to implement voluntary programmes.

However, some have opted for mandatory CPD programmes and a number of licensing bodies have decided in favour of mandatory CPD requirements for licensed engineers (Reference 1). Here in the Caribbean, the regional institutions have also been discussing these issues and some of the professional associations have taken the decision to pursue a number of education and training objectives, including implementing formal continuing professional development.

Following preliminary discussions between the Association of Professional Engineers of Trinidad and Tobago (APETT) and the Board of Engineering of Trinidad and Tobago (BOETT) in 1995, a position paper was developed and was presented at the Annual General Meeting of APETT in March 1996. The paper which recommended the establishment of a voluntary CPD programme for APETT members received very favourable response from the membership, and the Executive Council was mandated to proceed with the development of the programme. The Board of Engineering, for its part, has signalled its intention to introduce a CPD requirement for registered engineers.

Development of the Programme

A committee was established to develop the programme and to establish the administrative framework for implementing the programme. This committee has equal representation from APETT, BOETT, the Faculty of Engineering, UWI and the Institute for Higher Education, Research, Science and Technology (NIHERST). While the initiative for the exercise came from APETT and BOETT, it was felt that participation by the other two organisations at the earliest possible stage in the development of the programme would only benefit the exercise.

In addition to its role as a provider of formal undergraduate and post-graduate degree programmes, the Faculty of Engineering, through the Continuing Engineering Education Centre, is the major provider of professional development courses for engineers in the country. NIHERST, having broad responsibilities for tertiary education, is heavily involved in accreditation of tertiary education programmes, and has a considerable store of information and experience in these areas. The inclusion of these two institutions on the committee had the effect of broadening the discussion to a considerable extent, and allowed views, opinions and perspectives to be introduced into the deliberations which would almost certainly not have been introduced in their absence.

The committee examined the literature on Continuing Professional Development [2,3,4,5] including the CPD programmes and experiences of a number of engineering institutions.[6,7,8] After discussing these documents in the context of the Caribbean experience, a CPD programme was developed [9] and this has been sent to all the participating organisations for comment and approval. Some of the key elements of the proposed programme are presented below.

Elements of the Programme

(a) The primary immediate objective of the programme is to sensitize the engineering community on the critical need for all engineers to aggressively pursue professional development.

As a professional, the individual engineer must accept his responsibility to keep up-to-date in his field, and to continuously update and upgrade his skills in the face of new and developing technologies.

(b) Notwithstanding the responsibility of the individual engineer as stated in (a) above, employers also have a special responsibility to professional staff within their employment. Part of this responsibility is to provide adequate opportunity for their professional growth and development.

In introducing the CPD programme, efforts will be made to involve employers as fully as possible within the programme, and to convince them of the mutual benefit to employer and employee which may be gained from facilitating professional development.

(c) While the administration of the programme requires clear and measurable criteria for continuing professional development, and this implies the allocation of professional development units on the basis of the number of hours of study, the most important aspect of the programme is the knowledge gained and skills developed rather than the number of hours spent.

(d) Participants in the programme will be encouraged to prepare a professional development plan, based on which appropriate courses and events will be identified. This plan should take account of the professional goals and ambitions of the individual engineer, the business goals of the employer, and the technology trends in the particular discipline or sub-discipline. This plan will be reviewed on a regular basis.

(e) Participants will be required to acquire ten (10) professional development units (pdu's) each year. However, this will be monitored on a three-year moving total basis. A shortfall in any year can be made up in the succeeding years and extra credit can be carried forward for up to two years, subject to the requirement that the three-year total must not be less than thirty (30) units. The pdu allocation for approved CPD activity is as follows:-

- 1 pdu per hour of CPD leading to a successful examination,
- 1 pdu for every 2 hours of attendance-only CPD activity,
- 1 pdu for every 2 hours of approved private study,
- 5 pdu's for writing and presenting a one-hour lecture which qualifies for pdu's, when this is not part of one's normal occupation,
- 5 pdu's for a reviewed paper in a technical conference or journal.

(f) CPD events will be categorised into three classes:

i) *Technical Events:* These are events with predominantly engineering content,

ii) *Management Events:* These are events which enhance the participant's management skills and expertise, and

iii) *Professional Events:* These are events which enable members to develop their professional life skills.

Participation in selected activities of APETT such as lectures, workshops, site visits may qualify in this category. Activities such as editing technical journals and participating in career guidance activities will be encouraged through this classification.

A participant's CPD activities must include at least 5 pdu's from each category in the three-year total.

Administrative Structure

Systems will be put in place for participants to record their CPD achievements on an annual basis. These CPD logs will be submitted to APETT or to the Board of Engineering as appropriate.

Procedures have been developed through which these logs will be authenticated; these procedures have been designed to place as small an administrative burden as possible on the respective organisations. The existing Continuing Professional Development (Engineering) Committee, with its present structure, will be reorganised to assess CPD activities and to maintain a register of activities approved for the CPD programme. Participants may make representation for activities not previously approved to be considered, and suitable guidelines will be provided for this purpose. APETT and the Board of Engineering will use identical CPD logs and will share the register of approved activities. In this way, all participants will follow the same procedures and maintain one set of records, whether they are members of APETT, registered engineers or both. However, these two organisations may reserve the right to apply different standards in terms of the number of pdu's required on an annual (or three-yearly) basis.

CONCLUDING REMARKS

A proposed Continuing Professional Development programme for engineers practising in Trinidad and Tobago has been presented. The Association of Professional Engineers has taken a decision to implement this as a voluntary programme for its members, while the Board of Engineers has signalled its intention to implement the programme for registered engineers.

In its present form, the programme is not very onerous, and it is anticipated that engineers would have little difficulty in complying. The initial objective is

to sensitize engineers and their employers on the need for continuing professional development. The programme will seek to encourage engineers to develop professional development plans rather than simply signing up for courses and activities which appear attractive at the time.

It is also expected that by formalising the need for continuing professional development, course providers will be encouraged to focus more on this market and, as a consequence, more offerings will become available for engineers seeking to update and upgrade themselves professionally. This is particularly important for a small island state such as Trinidad and Tobago. Furthermore, since the offerings will be assessed and monitored to ensure that they meet the standards required for the purpose, there will be more systematic feedback to all providers to assist them in delivering courses meeting the needs of engineers.

The engineering community in Trinidad and Tobago has responded favourably to the proposal to implement this plan. Optimism has been expressed that this programme will serve to encourage professional development, and to improve the morale of local engineers. It is anticipated that the launching of the programme will have a positive impact on the quality of engineering and on the image of the engineer in the society.

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