



Competencies: Engineers as managers—an Australian case study

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Introduction

Thank you Dr Barcza, President of the South African Institute of Mining and Metallurgy, for inviting me to share our experiences in Australia as regards the competency movement and my Association's experience in assisting engineers become managers.

This is my second visit to South Africa, and I am struck by the similarities between our countries. This extends to the professional issues associated with engineering and competencies in particular.

I propose to outline two exciting stories today.

- ▶ Development of competency standards for professional engineers in Australia.
- ▶ Development of a management programme which has assisted professional engineers regain positions of leadership in Australian industry and government.

First of all I would like to outline the Association of Professional Engineers, Scientists and Managers, Australia (APESMA).

I am the Director Education with the Association and have been with the Association for some 6 years, I am not an engineer, but have had some 15 years experience in developing management development programmes for professionals. I have a Bachelor of Arts and an MBA.

APESMA is one of Australia's largest professional employee organisations. The Association is an expanding organisation with a current membership of 25,000, and a national staff approaching 90. APESMA offers a very wide range of professional services in areas such as remuneration, job evaluation, recruitment, finance, insurance and law. APESMA is also actively involved in making representations to governments and industry on issues affecting professional employment.

It is a not-for-profit organisation which exists to protect and advance the social and economic interests of employee professional engineers, scientists and the profession. It was founded in 1946 and has just celebrated its 50th anniversary.

Competency standards

Within Australia three bodies have the interests of professional engineers at heart, The Institution of Engineers, Australia, The Association of Consulting Engineers Australia and my Association.

Three times a year they meet as the Professional Engineers Joint Meeting. At these meetings they discuss and resolve issues which affect the profession of engineering. In

the mid-1980s the tripartite group resolved to begin the development of competencies for professional engineers. This development focused on the formative stages of the development of a professional engineer's career.

Stage 1

'Graduate Engineer; competency based on initial professional engineer knowledge in an engineering discipline, providing ability to work creatively and innovatively under guidance on professional engineering tasks of limited scope and complexity, and developing through experience and increased responsibility to work under general guidance on normal professional engineering work, exercising individual judgement and initiative in the application of engineering principles, techniques and methods.'

This fundamentally refers to the recent university graduate. Stage 1 provides the minimum requirements of the engineering degree. Universities thus have a minimum benchmark for the competencies to be achieved through the completion of a four-year engineering degree.

Graduates must meet the requirements of Level 1 competency to become graduate members of the Institution of Engineers, Australia, and engineer members of my Association. As such they may use the post-nominal PEng.

Stage 2

'Competency extended by experiential formation in an engineering discipline or field, providing the ability to undertake normal professional engineering work under general direction, and more novel, complex or critical professional engineering work under limited guidance.'

Usually four years professional experience is required to obtain these competencies. Demonstration of competency through an 'Engineering Practice Report' and interview provides for Corporate Member status of the Institution of Engineers, Australia, and use of the post-nominal CPEng.

Engineers at this stage must demonstrate competency in five areas or units of competency made up of the three following compulsory competencies:

- ▶ Practice skills
- ▶ Professional engineering planning and design
- ▶ Business management.

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Plus two of the following elective units of competence

- Research, development and commercialisation
- Materials or components
- Education and training
- Manufacturing or production
- Project implementation
- Asset management.

Understanding of 'Ethics and Principles' and competency in 'Communications' is assessed through interview and completion of the Engineering Practice Report.

Registration of professional engineers in Australia has been at the initiation of the tripartite Professional Engineers Joint Meeting. In the early 1990's the tripartite body resolved to establish a National Professional Engineers Register (NPER) and incorporate the first two stages and to develop a third stage.

The Register consists of three sections.

NPER-1, all Stage 1 engineers who are members of the Institution or the Association

NPER-2, all Stage 2 members of the Institution, that is, Corporate Members

NPER-3, applicants must meet Stage 2 competencies, plus have 4 years experience and satisfy the following guidelines:

- have direct or indirect responsibility for the planning, design, execution or review of some specialised technical aspect of engineering projects or programmes *and/or*
- have ultimate responsibility, often extending beyond any one discipline, for the technical integrity of engineering projects or programmes *and/or*
- are engaged in professional practice which either directly or indirectly, calls upon their engineering knowledge, skills, experience and judgement, and have significant influence on engineering projects or programmes, *or for the management category only, that they:*
- are engaged in professional activities which call on their engineering qualifications and experience, and which place demands on their skills, knowledge and judgement comparable to those experienced in the above aspects of engineering practice, *and for all categories;*
- can certify that, during the preceding three years, they have maintained a satisfactory level of continuing professional development, and
- have for at least the equivalent of one full-time year
 - been engaged in independent practice; and/or
 - worked as an employee under only general direction; and/or
 - been enrolled in a formal postgraduate course.

The engineering bodies expect that Stage 3, or NPER-3, will increasingly be used by employers and clients of engineering services as quality assurance of the capability of individual engineers. Further, legislation at State and Federal level may see NPER-3 registration as a requirement for certain areas of practice and the basis for professional liability capping.

NPER-3 registrants select a college or area to belong to from the following;

Civil, Mechanical, Electrical, Biomedical, Structural, Chemical, Environmental, and Management.

Registrants seeking the Management area must also be able to meet one of the engineering discipline specific criteria.

Additionally registrants commit to maintaining their continuing professional development at 150 hours per three-year period.

The future

Accrediting organisations to assess competence

The burden of assessing individual applications for each level has caused the engineering bodies to review the assessment process. A number of organisations are trialing the development of in-house training programmes which, when successfully completed, will lead to automatic registration of individual employees. The programmes will then be regularly audited by the National Professional Engineer Registration Board.

Work commenced on Level 3 and 4 competencies

Discussions have commenced which may lead to the development of competency standards for Levels 3 and 4.

Concern at response and application process

The profession is raising concerns that the Stage 2 and the NPER-3 registration is too complex. Completion of the Engineering Practice Report is no small task. This complexity has resulted in relatively few applications received by the registration body.

A further factor inhibiting engineers seeking registration at NPER-3 has been the issue of liability capping insurance. The original aim had been to reduce professional engineers' liability, however, developers who may seek to hire professional engineers are refusing to hire engineering consultants who may have limited liability. The result is that professional engineers have not sought to limit their liability through NPER-3.

It is interesting to note that the architects' profession has chosen not to enter the liability capping scheme for this reason. It is also worth noting that one Australian state, Queensland, has its own registration scheme independent of NPER and demonstrated competency.

The APESMA Management Education Programme

Origins of the Programme

During the late 1970s and early 1980s the Association was becoming increasingly concerned at the attitudes of politicians, employers and possibly the community, towards professional engineers. There was a general perception amongst these groups that, whilst professional engineers had strong technical skills, they lacked the broader managerial skills which were seen as a necessary balance to their technical skills. This perception was reflected in the emergence of non-technically qualified personnel into senior managerial positions. These positions had traditionally been the province of professional engineers.

In the light of findings indicating low participation of professional engineers in formal management education, the Association approached a number of tertiary institutions, to encourage them to develop programmes that would provide greater access for professional engineers. In particular the Association was interested in the development of Masters of Engineering Management programmes. These approaches

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met with very little success, the universities were disinterested in responding to this niche demand.

The Association subsequently decided that it should consider making available a management education programme for its members and the profession, and decided to conduct an international search for best practice in this area. The Association became aware of a programme operating in the United Kingdom by the Institution of Mechanical Engineers (IMechE). Discussions with the IMechE convinced the Association that a programme similar to that offered by that Institution would be suitable for Australia.

The Association was also very impressed with the work the Open University was doing with distance education management programmes.

The Association decided that it should establish an alliance with an Australian university and deliver a programme on a distance-learning basis. This approach was supported by research which found that engineers were discouraged from undertaking existing programmes because of the following short-comings.

- The inability of engineers to maintain regular attendance at lectures, tutorials and residential schools, due to work commitments.
- The diversity of candidates in the programmes, which meant that a number of units required to be taken repeated study familiar to engineers, and other material was seen as not being all that relevant to the practice of engineering.
- The inefficient use of the academic year, in that only 26–30 weeks were used for delivery of the programmes.
- The likelihood of engineers being moved interstate/overseas, and therefore being unable to complete the programmes, and
- Family, work and community responsibilities which made it difficult to attend lectures, etc.

The Association established the following principles which would apply to any programme with which it was involved.

- The programme would be accessible to professional engineers wherever they lived in Australia or overseas.
- There would not be a requirement to attend lectures, and therefore the programme had to be designed on a fully distance-learning basis.
- The programme would be built for persons with professional engineering, science and technology professional level qualifications, and therefore would assume a high level of numerical, analytical and statistical skills, along with an ability to absorb information quickly.
- A programme which could be done at home after the children have gone to bed, or in locations throughout the world.
- A programme which could involve industry in its delivery.
- A programme which would be recognised by Government agencies, professional bodies and employers.

The Association subsequently held discussions with a number of universities to ascertain their interest in becoming involved in the programme. Finally, it was decided that the university that could offer services that were most relevant to

the Association's needs was Australia's Deakin University. The Association was particularly impressed with Deakin University because of its international standing as a deliverer of high quality distance learning management education through its existing MBA programme, and its success in developing other courses. In 1995 Deakin was awarded the title of University of the Year.

The Association entered into an alliance with Deakin University in 1988. This alliance involved the University in converting manuscripts prepared by the Association's Study Guide authors into a distance learning format, publishing those Study Guides and arranging examination venues.

The Association maintains control over the curriculum, the hire and direction of Study Guide authors, marketing, development and administration of the programme.

Before the decision to proceed had been taken by the Association, senior staff had been engaged in extensive consultations with chief executives of public and private sector organisations in an attempt to seek their views on the structure and content of a management education programme. The Association received a very positive response from industry to its proposal, though there may have been some scepticism as to whether the Association could deliver such a programme. The assistance from industry was very important in ensuring that the structure of the programme was relevant to the needs of industry.

This process of consultation led to the establishment of a Management Education Board comprising chief executives from industry and senior academics with experience in the delivery of management education. The Board now has international representation.

The decision to proceed with the development of a Graduate Diploma in Management was made by the Association's Federal Committee of Management in November, 1987, and the programme received its first enrolments in January 1989. This sixteen month time-frame was a period of hectic activity, and is probably best compared with a university time-frame for a similar activity of at least three to five years. The fact that the Association was able to move quickly to develop and implement its programme reflects the ability of the programme to operate without the traditional bureaucratic constraints of a tertiary institution. The Association is able to adapt very quickly to emerging circumstances.

In 1997 4,000 students participated in the MBA (Technology Management); on available data this represents more than 25% of the MBA market in Australia! (There are at least 41 other MBA's in Australia.)

Some statistics of interest

Average age of participants—35.

Overseas enrolments:

Hong Kong	122
New Zealand	130
Malaysia	53
Singapore	51
Papua New Guinea	31
Indonesia	25
Fiji	16
USA	15
Thailand	13
South Africa	6

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25% of students already have a masters or PhD.
Participants are predominantly engineers and other technology professionals;

75%	Engineers
15%	Scientists
5%	IT Professionals

Over 2,000 organisations have participants in the programme.

Total of	3,629	graduates
	2,875	Graduate Diploma graduates
	747	MBA graduates.

Some programme highlights

- 25% of the Australian MBA market
- high level of industry input
- customer feedback sought and integrated into the programme
- programmes awarded Engineering Excellence Awards
- international advisory board
- links with universities in Hong Kong, UK and Canada
- link with the Open University UK to make the programme available in Europe
- first administration of an MBA to be awarded ISO9002
- first Australian programme to be launched in India
- first Australian programme to be launched in South Africa.

In South Africa we have discussed with the Engineering Council and other professional engineering bodies the development of an elective unit, Professional Practice in South Africa. We expect that we will establish a relationship with ECSA to write this unit. The unit aims to bring into one cogent volume the management issues which are necessary for professional practice in South Africa. This unit will have an emphasis on law in the South African context and will be an alternate for the compulsory law unit presently contained in the MBA for South African participants. We believe that this unit will be attractive to South African corporations as part of their new graduate development programmes and professional engineering bodies as a component of their CPD requirements. Another market will be those participants from overseas who may be intending to work in or trade with South Africa, who will study the material as an optional unit.

Graduate Engineer Development Programme

The Graduate Engineer Development Programme came about as the result of a number of convergent circumstances.

- Members of the Association, both experienced engineers, and new graduates were becoming increasingly concerned at the lack of graduate engineer training that was being offered to new graduates. Members could see that the lack of engineer development was likely to affect the propensity of the profession to respond to demands in industry and government in the future. This was also identified in a recent Institution of Engineers, Australia report, which said; 'The Institution is tipping future shortages of skilled engineers unless steps are taken to address diminishing on-the-job training opportunities for recent graduates'.
- Members also advised that it was becoming increasingly difficult for their new engineers to achieve

all of the competencies required of the Institution of Engineers, Australia to become Corporate members.

- We launched in Australia in 1996 a Certificate in Frontline Management. This programme was developed fundamentally for para professionals who were moving into first level supervisory positions. As we discussed this programme with a range of organisations we were consistently being advised that this was exactly what was required for recent graduates.
- And finally, we were becoming increasingly of the view that the complex environment in which engineers operate as professionals should be examined in our MBA (Technology Management), to this end we decided late in 1996 to develop an MBA elective unit called Professional Practice in Australia.

So, we had before us demand and a range of training services. We did some market research and took the view that a Graduate Engineer Development Programme would meet the demand for training.

To quote again from the Institution's report;

'The Institution asserts that if the private sector only trains to the extent that it has in the past then it is going to see a massive shortfall of skilled engineers,

They go on to say,

'The medium-size companies are where the Government is pinning its economic hopes, but we (the Institution) know from the membership that these companies do not have the excess capacity to take experienced staff off their work to train new staff. It's a double whammy. They are saying that not only does training young staff cost them in financial terms, but if they have to put a senior engineer's time into it they are losing out twice'.

The Association believes that the Graduate Engineer Development Programme addresses the concerns of the Institution and industry. However, and this is an important point, we are not and cannot, provide the engineering experience that is important to professional formation. This remains a critical role for employers of graduate engineers.

Through the programme we are aiming to advance and enhance the professional development of engineers.

The Graduate Engineer Development Programme consists of three stages:

- The Certificate in Frontline Management
- The unit, Professional Practice in Australia
- An elective unit from the range of Graduate Diploma/MBA units.

The programme can be studied over a period of eighteen months and up to three years. The programme is designed to be completed fully in the distance education mode. A mode of study which has proven to be exceptionally popular amongst professional engineers.

We hope that this programme will be of interest to the profession in South Africa where we would include the Professional Practice in South Africa unit.

I have highlighted in my presentation a case study of developments which have taken place in the engineering profession in Australia. South Africa has a golden opportunity to learn from Australia's mistakes and her successes, you can also draw on the experiences of other countries. I strongly recommend that you take the opportunity to refine the wheel rather than going through a process of re-invention. ♦