

## The Engineering Skills Pipeline

The international benchmark of an average population per engineer shows that South Africa lags behind other developing countries. In South Africa, one engineer services 3 166, compared to Brazil's 227 and Malaysia's 543 per engineer. The discrepancy in the benchmark points to one thing: South Africa is severely under-engineered.

The shortage of engineering practitioners is evident in the number of competent engineers available for ongoing projects. It has also led to cases where work which requires input of competent engineers is carried without such input. However, this cannot be allowed to continue as all spheres of government are dependent on engineering services to address vital needs for South African communities.

Any sustainable solution aimed at addressing the skills shortage needs to take into consideration all levels of education.

### *The Schooling System*

Prior to 2008 only 25 000 Higher Grade Matric Mathematics passes were obtained and given these low figures, the pool of suitable students is even less. Following the introduction of the National Senior Certificate (NSC), the number of students writing Mathematics increased significantly. However, the increase did not translate to higher levels of students who meet the basic requirements of admission for engineering programmes.

ECSA states Physical Science and English as essential subjects for admission in engineering programmes. The National Senior Certificate leavers who have acceptable levels of Mathematics, English (Higher Grade) and Physical Science (MSE) is the target group for engineering. However, the engineering profession competes with others such as accounting and health sciences. ECSA believes that the pool of talent from which engineering skills are sourced should be expanded and says a logical solution would be focusing on previously disadvantaged groups as the majority.

In an attempt to address the challenge of skills development level at grassroots levels, ECSA will soon introduce an initiative called Engenius, which is aimed at coordinating various initiatives on career guidance and recruitment for the engineering profession.

### *Higher Education System*

In an attempt to address the challenges faced at tertiary level, ECSA sets minimum standards for engineering programmes and ensures that these are being met through accreditation. Furthermore, the organisation facilitated the founding of the South African Society of Engineering Educators (SEESA). SEESA provides a platform for the exchange of best practice and links engineering educators in South Africa to an international network.

ECSA is also cognisant of the challenge of limited resources such as a shortage of teaching staff due to lack of funds and the lack of financial aid for students. The Council is exploring the possibility of having engineering placed in the highest funding category of the state subsidy to address staff shortages. In an attempt to assist students who require financial aid, ECSA has facilitated the introduction of the South African Youth into Engineering Programme (SAYEP)

initiative. SAYEP is a partnership programme between various industry-groups aimed at generating funding for students who want to enroll for an engineering programme.

### *Candidacy Programmes*

The starting point should be to understand how the graduate develops the competencies required for registration with ECSA. The process relies on the supervision of the graduate's work by a competent engineering professional.

Firstly, the graduate should undergo induction, and then observe processes and work of competent engineers. The candidate should assist established practitioners and perform specific processes under close supervision. The level of supervision is then reduced as the candidate performs specific processes as directed by supervisors and full responsibility is taken for supervised work. The candidate then progresses to performing specific work with detailed approval of work outputs. Full responsibility to the supervisor is taken for the immediate quality of work. Finally, the candidate works in team without supervision and recommends work outputs to the supervisor. Responsibility is still to the supervisor but is as appropriate to a registered person.

This method of developing candidates from graduation was historically embedded in organisations, parastatals, municipalities, engineering firms, mining companies. With the move to a lean organisation, there has been a retreat from this culture and practice of training. In many companies that hire engineering graduates, programmes are haphazard and supervision and mentoring are lacking. That is not to say that there are no exemplary training schemes. The consequence for ECSA, which is a consequence for the country, is that the rate of conversion of candidates to registered professionals is limited.

The challenge is then to restore and expand the candidacy programmes that develop the individual from graduate to professional level so that the evidence of competence required for the registration application can be presented. This is a multifaceted problem: organisational commitment, an adequate supply of supervisors and mentors, the role of incentives, systems for managing training.

Existing funding models, for example learnerships, have not proven equal to the requirements of the type of development programme described above, particularly as it will last in excess of three years.

ECSA encourages various industry groups to make an effort to develop skills, and further believes that competent engineering are essential to meeting a wide-range of basic needs which are critical for the well-being of the country.