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Engineering Skills – Key to effective service delivery

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Large and smaller infrastructure development and refurbishment projects in South Africa are already and will in the future place increasing strain on resources and the pressures around skills availability and development are increasing. These pressures are no less apparent in the electrical and other engineering industries. How serious is this situation, what impact is it having, and where to from here?

Introduction and Background

It is now common cause that in South Africa we are faced with a chronic skills shortage in the engineering sector. We are faced with a multi-faceted problem in this respect, including factors such as

- The historical education legacy in South Africa, where skills were disproportionally developed in the population.
- A global demand for skills in this sector, with the resultant global mobility of these skills.
- The deficiencies in the present school system and in particular the low numbers of learners with sufficient grade levels in maths and science to undertake tertiary education in the engineering sector.
- The collapse of traditional artisanal training.
- An inadequate contribution through the SETAs.

These resources and skills related problems are reflected across the industrial and engineering sector in South Africa, confronting us with a huge international challenge, and global competition for a finite quantity of these requirements. By way of illustration, in presenting their interim results in March 2007 in Johannesburg, Sasol reported "moderate delays and increased costs" on certain of their projects, owing to a global shortage of engineering and construction resources. They provided interesting figures, citing their internal studies on some 184 projects with a value of R62 billion that would materialise over the next few years. These studies indicated that projects were likely to take some 11% longer to complete than first anticipated. Sasol CEO Pat Davies was reported as saying that a recently released international benchmark suggested that projects indexed at a cost of 100 in 2002, came in 60% higher in 2005 and were likely to be indexed at 180 by 2008.

These same challenges are being experienced across the various engineering industries, including electrical engineering (and electrical distribution). We are faced with an ongoing exodus of skilled and experienced staff, placement in many instances of relatively inexperienced persons in positions of responsibility for which they are ill-equipped and often therefore "setup for failure", inadequate mentoring and training due to the exodus of skilled and experienced staff, and an inability to obtain (and/or attract) staff with appropriate skills and experience. This has resulted in negative effects in aspects such as maintenance, planning, design and engineering management and, for example, electrical network management and status.

Situational Analysis

Comparative international figures provide an illuminating perspective on our skilled resources in the engineering sector in South Africa. Comparative figures indicate that the USA produces of the order of 380 engineers per million people, China 225/mill, India 95/mill, and South Africa about 45/mill. Other studies show that whereas Western Europe, North America, India and China have between 130 and 450 people per engineer, only one out every 3200 South Africans is an engineer, which represents between a 10 and 20 times disadvantage. Consider also that a country like Taiwan, which has half the population size of South Africa, produces about 10 times the number of graduate engineers as South Africa. Similarly between 30 and 46% of all graduates in China are in engineering – about half a million graduate engineers and technicians produced per year.

South Africa produced an average of approximately 1272 engineers and 2036 technicians and technologists of all disciplines per annum (averaged over a 7 year period to 2004), the highest percentage group in both categories being in the discipline of electrical engineering (around 35% of the total number of university engineering graduates and 38% of the university of technology engineering graduates over the 7 years from 1998 to 2004).

These figures, compiled by the Engineering Council of South Africa (ECSA) for the period between 1998 and 2004, are very interesting, although some recent analysis suggests that they may be slightly understated, the number of engineering graduates being closer to 1400 and the number of technician and technologist graduates a little over 3000 per year. Figures for subsequent years are not presently available from ECSA. Nevertheless, the following graphs are interesting:

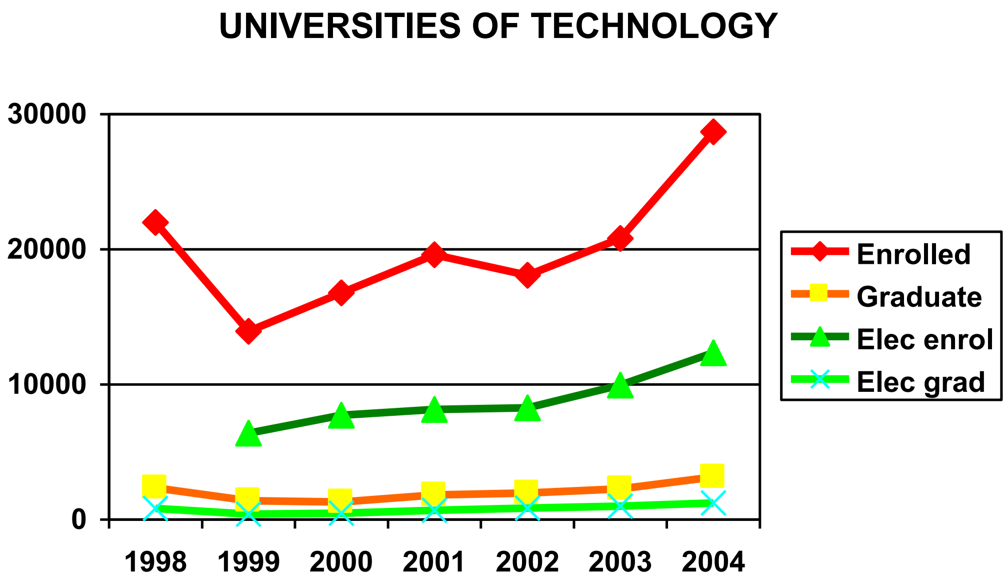

Figure 1: Enrollment and Graduation figures at Universities of Technology (technologists and technicians)

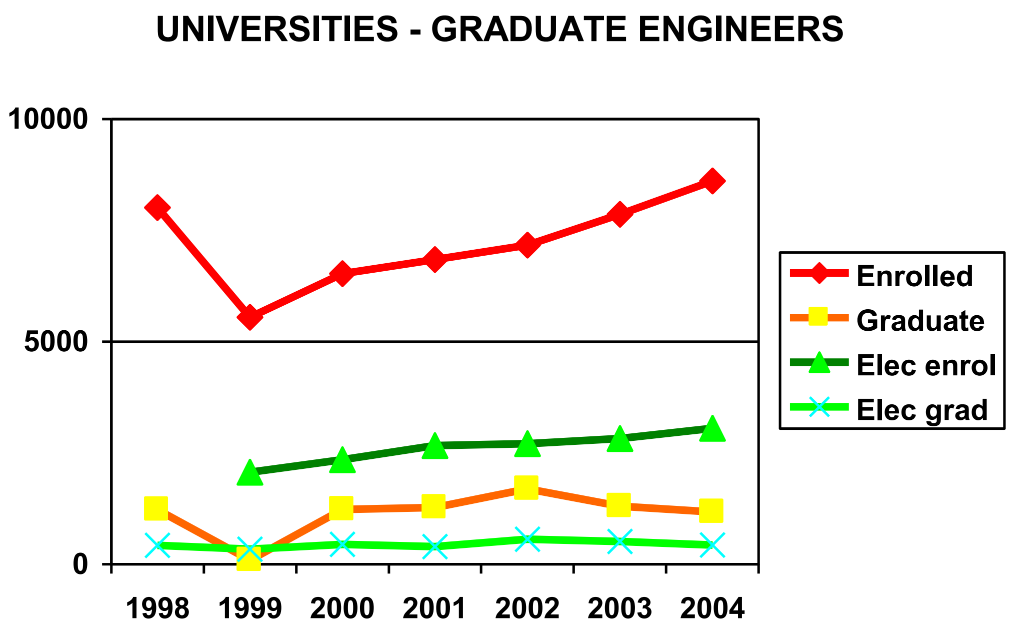

Figure 2: Enrollment and Graduation figures at Universities (Graduate Engineers)

Whilst accurate data for subsequent years is not presently available, the trends clearly show that there are some significant challenges ahead. It has been made clear by the Department of Education and the JIPSA task team that the level of graduate engineers needs to be increased from the present levels of 1300/1400 per year to 2400 within the next 4 to 5 years. This problem is exacerbated by the crisis in engineering education where staff vacancies are at astonishingly high levels. In addition, academic salaries in the technical fields have been eroded so significantly recently that filling vacant posts, let alone urgently attracting the additional staff needed to deal with the increased student numbers, is very difficult if not completely impossible.

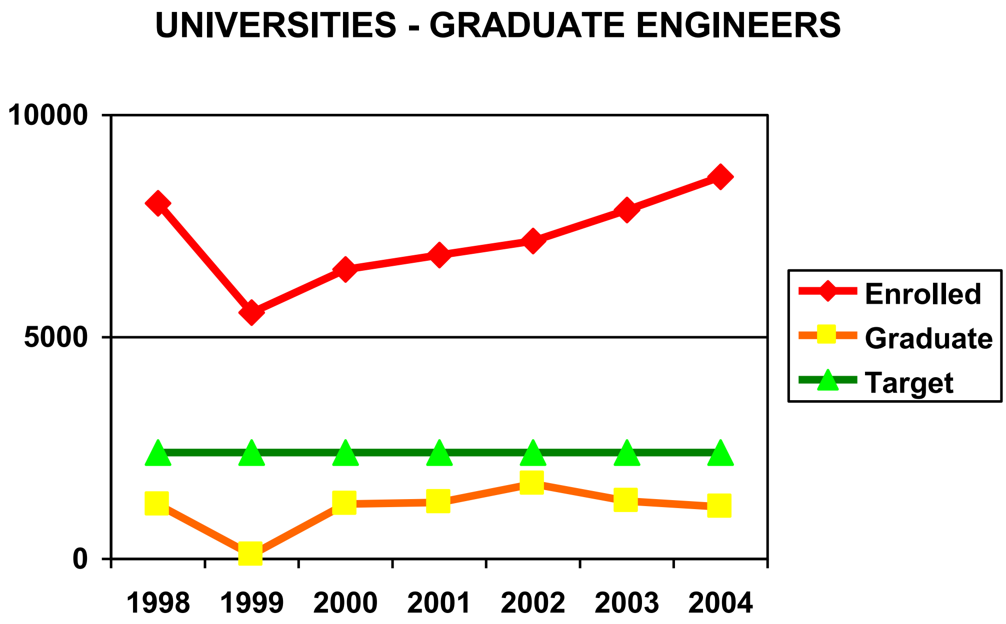

Figure 3: JIPSA targets for Universities (graduate engineers)

It is important to understand that the skills shortage is being experienced across the engineering team. In considering the composition of the engineering team, the traditional pyramidal model, comprising engineers, technologists, technicians, and skilled and unskilled artisans provides a useful insight. Whilst shortages are experienced across the board, the base of the pyramid (the artisan level) is particularly problematic and requires urgent attention to stabilize this foundation of the resource base.

The collapse of the traditional artisan training structures has resulted in levels of artisan training dropping significantly. Previous reports have indicated numbers around 30 000 registered artisan apprentices in 1975 dropping to an estimated 3000 in 2006. More recent reports indicate that the country is producing around 8000 qualified artisans per year through the combined Indlela and SETA processes. The March 2007 JIPSA report also notes that while the economy is producing approximately 5000 *[SETA]* artisans per year, research indicates that at least 12500 artisans should be produced per year over the next 4 years. Other indications are that this figure should be much higher as also noted in the graphical illustration below. The reported average age of artisans in South Africa at present is in the mid-fifties.

Much therefore remains to be done, particularly if one notes, for example, that in the past 4 years to March 2008, whilst the throughput of the COTT/Indlela process (for Automotive Eng; Electrical Eng; Mechanical Eng; Service, Manufact & Process Techn; Physical Planning & Const sectors) has remained largely consistent at an average of 3079 passes/annum, the pass rate has dropped consistently each year from 49% in 2004/5 to 37% in 2007/8.

If we then consider the pyramidal structure of the engineering team, and assuming we need at least as many Technologists as Engineers, we probably need to at least increase the number of technologists (BTechs) up to about 2400 per year (about 3 x time current 800/annum) and the number of National Diploma graduates up to at least about 7000 per annum. If we then factor in the number of artisans required, and look at the current reported apprenticeship and production levels, the challenges are obvious.

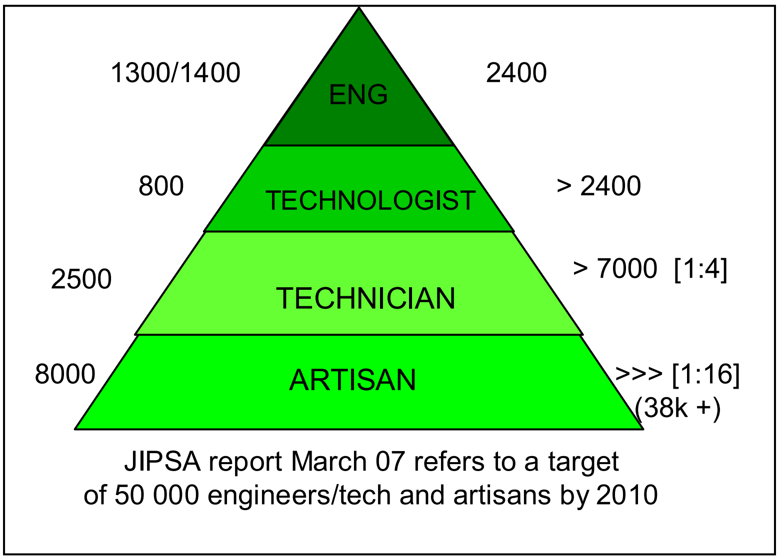

Figure 4: Extrapolated requirements for the engineering team, based on JIPSA targets

Whilst there are various initiatives aimed at increasing the output of our engineering team, such as the JIPSA (Joint Initiative for Priority Skills Acquisition) initiative as just mentioned, the essential limitation with schemes such as this is that they will only have a significant impact over the medium to long term. Furthermore, in order to produce more engineers, technologists and technicians, it is necessary to feed more students into the tertiary education system. This means that it is critically necessary to increase the number of "qualifying students" - those with good enough school grades in mathematics and science, the right aptitudes and the right level of preparation (and of course the right committment).

It is important to understand this pipeline of engineering capacity development, and more will be said shortly. Contrary to assertions made in support of the proposed new Built Environment Professions Bill (of which engineering forms a part), professional registration is not the primary bottleneck in this pipeline in developing skills, nor is it a racist gatekeeping role as has been alleged. The statistics show that of all ECSA registrations in the past 3 years, 56% were PDIs. In electrical engineering, 61% of all new registrations for PrEng between Jan05 and August 08 were PDIs.

As already noted, sufficient availability of suitable lecturers and tutors remains a significant challenge in addressing any increase in enrolment numbers and throughput.

In respect of artisans, it is encouraging that in the last few years in particular, industry has realized the need to establish retention and training programmes in order to secure the skilled resources that are required. It is also encouraging that Government appears to have also realized the urgent requirements and apparent inability of existing structures to deliver the required skills base.

It is quite clear from industry reports and comments that the current SETA approach is not working in delivering the required skills and quantity of skills required in this sector, and that a compete review of the current philosophy and structure is required. Indeed, the revelations in May 2008 of large scale alleged corruption and other issues within the Energy SETA for example further serve to underscore the urgent necessity to re-evaluate the system and plot an appropriate course with industry that will address the problem in a sustainable and effective manner.

Electrical Sector

The drawn out electricity distribution industry restructuring process has created uncertainty and contributed to underinvestment in refurbishment and maintenance (and continues to do so), and particular problems related to availability and retention of skilled resources have been identified. These distribution industry problems are effectively another real crisis area, along with the generation reserve margins and plant availability issues currently faced in South Africa, and skilled resources have been identified as being fundamental issues, with a significant resultant impact in the management and status of the distribution infrastructure.

NERSA (the national energy regulator) commissioned an independent sample audit of 11 distribution utilities a few years ago and the report was completed in 2006. These sample utilities included two Eskom distribution regions or areas, and both large metropolitan municipalities as well as smaller municipalities. The results were both interesting and in the main of huge concern. To highlight a few of the results of this independent audit:

- The audit reported that the findings in respect of the two Eskom distributors audited were markedly different from the municipal utilities, and they were found to be well run and managed undertakings. General findings included excellent and comprehensive asset management and maintenance systems, adequate funding for maintenance and refurbishment, adequate staffing at all skills levels with access to sound and competent technical expertise, and adequate resources throughout.

- In the case of the large municipal undertakings and metros, the audit found that this class of utility displays a level of robustness which can be seen to be "faltering", and commented specifically that lack of investment since the advent of the EDI restructuring hiatus was now evident. It also commented that it was increasingly evident that a dearth of skilled staff has resulted in the embrittlement of management resources and loss of control over essential technical elements such as planning and protection. The audit also highlighted insufficient investment in refurbishment and maintenance processes and continued loss of skills coupled with an increase in the average age of skilled senior staff.

- In the case of smaller municipalities, these undertakings were found to be generally in poor shape, being heavily under-resourced and stressed in the delivery of the required levels of services and the audit report noted "there is little doubt that serious customer complaints are in the pipeline". General findings also included that the networks are in a poor state of repair, staff are demotivated and often under-skilled, very few formal systems for maintenance management are in place, there is poor housekeeping and there is great reliance on individual engineers and technicians with consequent risks when they leave.

Other as-yet unpublished and more broad ranging investigative studies have further illustrated the extent of the problem in the electricity distribution sector. To highlight some surveyed indications in the period since 2003 from a significant sample of the distribution sector utilities:

- Only approximately a third of the distribution utilities surveyed had sufficient competent staff.
- In only 15% of those utilities surveyed was the network found to be in an acceptable condition.
- Acceptable maintenance plans were only available in approximately 43%, and acceptable technical asset registers in only 23% of the utilities surveyed.

The network's operational and maintenance conditions, and the key support planning issues as noted above, are significantly influenced and impacted by the insufficient competent staffing levels found.

The situation at Eskom, whilst more broad-reaching within the electrical sector, is also illuminating. At a recent presentation to the Engineering Council of South Africa, whilst some positive trends were indicated in respect of technologists and technicians, significant challenges were seen to exist at the engineer and artisan level. Given the ratio of engineers to artisans in the engineering team (as illustrated earlier), this is surely an indication that artisanal training in particular must be a major issue of concern moving forward. In respect of graduate engineers, I have heard unofficial numbers that Eskom is down from about 3500 graduate engineers in 1998 to about 1000 today.

Eskom, for an example, is now tackling training decisively with the Eskom Academy, where the focus will be on developing on-the-job skills at all levels of the engineering team.

Challenges and Constraints

The 2007 matric results again underlined the major challenges faced in respect of the availability of prospective students to enter into tertiary engineering programmes. The number of Higher Grade passes in Mathematics reportedly increased marginally by 0.8%, whilst the number of Higher Grade passes in Science decreased by 5.6%. This against reported increases in the Standard Grade level passes for these subjects of 12.1% and 7.8% respectively. The Minister of Education noted "with some alarm the inadequate progress in higher grade passes in mathematics and science". She added that "However, there are encouraging signs of progress. Our Dinaledi schools initiative (the introduction of centres of excellence in maths and science) must be given focused attention and support as must our priority of ensuring that every child studying mathematics and science has a qualified and competent teacher for these subjects". This latter priority is a particular challenge given the extent and teaching demands of the new curriculum.

If we consider the actual numbers in the 2007 matric results, only 25415 students passed Higher Grade Mathematics and 28122 passed Higher Grade Science, enabling them to pursue a higher technical career. Of this number, only approximately 8000 achieved a C-aggregate or higher in Higher Grade Mathematics, which is the typical entry level for a university engineering programme. We then need to consider that not all of them wish to pursue a technical career (and are able to select any one of many degree programmes, engineering being only one), and many do not have the other necessary attributes or support to successfully start or complete a demanding higher technical course, and not all of them will eventually complete their tertiary education in engineering.

School grades are no longer considered a reliable measure of preparedness for university study and success, and school performance is becoming a less and less accurate means of measuring likely performance at university, although the problem of finding the number of school leavers with sufficient marks in the right subjects to enter the system is an even bigger problem. In their paper "Engineering Education in South Africa: In fragile good health, denial or crisis?", Hanrahan et al noted that "Matriculants with symbols that formerly were considered adequate for engineering study are underprepared for engineering study. This shift is noted in the school system and matriculation examination. Good grades reflect focused training for examinations based on technique and rote-learning rather than a lasting knowledge and appreciation of the subject".

The paper goes on to also note two further factors that are dominant in determining student performance, these being the level of commitment on the part of the student given the demanding nature of engineering programmes, and more critically whether the student can afford the cost of studying.

It is therefore obvious that we need to dramatically increase the output of *adequately prepared* school leavers (in the broader sense, including thinking skills, literacy skills as well as actual knowledge) to feed into the engineering tertiary education system. This in turn raises questions regarding some of the changes in our school system, such as for example the discontinuing of higher grade studies, and additional mathematics. It is critical to encourage and promote (directly and indirectly) a culture of excellence and genuine achievement, as opposed to a culture of mediocrity and an illusion of success and excellence. Anything else is actually a disservice to our learners and to the needs of our country.

Further areas of concern regarding changes in the school system relate to Mathematics in the new National Senior Certificate. In the first instance, the numbers of learners studying Mathematics (as opposed to Maths Literacy) may not be as high as originally anticipated. Furthermore, as the third paper in Mathematics is optional, a large number of learners may be entering University engineering programmes without having completed, for instance, geometry at school level.

The current emphasis on the achievement of an academic matric or now National Senior Certificate, and the social acceptance of vocational training versus academic education, are issues that must be urgently and seriously engaged and debated across our society, industry and government. We need to encourage our youth (and their parents) to seriously consider and take up vocational training options, for example at FET colleges, ensure through government that sufficient opportunities exist in this respect, and ensure that such education and training is appropriately valued and recognized, not as second class, but as a viable, valuable and respected education and career option.

If it is considered that the average time from Grade 10 to the end of a typical engineering degree is 8 years, with no allowance made for GAP years and other assorted activities, it implies that it takes at least at 10-11 years to produce a professional engineer beginning to be independently productive. And the time to produce a registered BTech technologist or a NDip technician is not a lot shorter. Putting it another way as an example, a learner in grade 10 in 2008 who decides to take up engineering will (if he or she passes everything along the way and graduates in 4 years, which is not the average) only enter industry in 2015 and be eligible for registration as a professional engineer in 2018.

Furthermore, in considering increases in throughput and student numbers, the challenges of funding and teaching resourcing in the tertiary engineering sector are significant.

The skills shortage in the engineering and technical sector is not unique to South Africa, and is a global issue. This implies that these skills are globally marketable and sought after. Retention of existing skills is therefore a challenge requiring priority attention, as the competition to attract new skills is high. This has significant implications in terms of micro issues such as career growth and opportunities, attractions of other sectors and earnings (and therefore costs), and is significantly influenced by macro issues in the country, including quality of life and security.

Retention of skills within the engineering sector is particularly important, as the nature of the education and training received, for example problem solving and analytical skills, make technically trained people attractive to other sectors where financial and other career benefits may be better.

The shortage of skilled resources also results in supply and demand imbalances driving resource costs higher. An inability by distribution utilities to adequately address this through differentiation and an inability to pay market related costs further exacerbates the situation.

The global nature of the skills shortage also implies that importation of skills is not an easy fix. In a report discussed in an article in Business Day on 5 March 2007, Ann Bernstein and Sandy Johnson of CDE (Centre for Development and Enterprise, an independent policy research and advocacy organisation) point out that in South Africa we face three realities:

- We operate in a global market for skills
- We struggle with a historical legacy which developed skills disproportionately in our population
- We are following a path of economic growth that will not be sustainable if we do not achieve an urgent and large-scale injection of skills into the economy

In discussing the importation of skills, the report notes that despite high-level government statements that seem to accept the potential of a well managed immigration policy to alleviate our skills shortage, these have not been followed through. The article states that in 2006 just 194 permits were granted for people with scarce skills, under a quota system that allowed for 47600.

Whilst this throughput situation has reportedly improved in the past year, significant challenges still remain in respect of being able to import engineering and technical skills in this global situation. These include not just the processes involved, but the macro factors (the “push” and “pull” factors) that need to be addressed to make South Africa an attractive place for skilled members of the engineering sector to practice their profession or trade. Challenges in respect of issues such as cultural idiosyncrasies, language difficulties, retention of intellectual capital and relative remuneration are also all challenges that need to be addressed in order to effectively utilize skills importation as one of the options in the basket of possible solutions.

Furthermore, problems have already been encountered in South Africa in respect of imported skilled resources, and the relative standard and level of those skills. Registration or licensing of technical persons is an important issue, in respect of both direct and indirect safety issues relating to engineering personnel and the public, and general protection of the interests of the public. Problems can and have been encountered where resources are imported to be utilized in positions of technical responsibility without due consideration of these issues beforehand, where the levels of training and experience have subsequently been found to be inadequate in respect of (internationally benchmarked) South African standards or mismatched to the anticipated level of appointment (eg technologist vs engineer), or where difficulty is encountered in verifying and/or benchmarking foreign qualifications. Maintaining standards in this respect is not "gatekeeping" as has sometimes been alleged, but is an essential reality determined by the need to protect the interests of the public and maintain health and safety standards, all in accordance with international benchmarks. Whilst optimization of the processes involved must be regularly assessed and enhanced as appropriate, particularly to ensure efficiency within an objective and fair framework and process, compromising standards is not an option.

Industry transformation and skills growth amongst the previously disadvantaged sector is critical to addressing the skills shortages being experienced in South Africa. It is encouraging to note ECSA statistics that in the last 3 years, 56% of all new registrations have been previously disadvantaged individuals (PDIs) – this in a scenario where registration is still effectively voluntary due to delays in the implementation of the identification of engineering work. The historical legacy implies that transformation growth has to come largely from the younger generation in the industry, and it is encouraging that this seems to be happening through education throughput and subsequent entrants to the industry. Certainly, our SAIEE membership demographics also reflect that this transformation process is happening at an encouraging and increasing rate.

With the ongoing skills shortage and industry demands in the engineering sector, many younger and/or less experienced members of the engineering team are finding themselves placed relatively early in their careers in positions of significant technical and/or managerial responsibility. It is important that these people are not "setup to fail" through their relative inexperience, and mentorship is a key support mechanism to assist people such as these, and indeed all younger members of the engineering team, in the successful development of their careers.

Unfortunately the demands of work commitments mean that in some organisations' senior engineering staff are stretched and unable to offer younger members of the engineering team this mentoring facility. In other organisations' there may simply not be that reservoir of senior advisors and experience available. This is a key challenge that must be further addressed as a matter of urgency, through utilities and industry directly as well as through the various institutes and engineering industry associations.

Conclusions and the Way Forward

It is clear that much creative thought and debate lies ahead in addressing the skills resources issues and problems, particularly in the short term but also in respect of the medium and longer term, but it is equally clear that they will only be solved by all the stakeholders putting aside differences in ideological and constrained thinking, thinking "out the box", and by working towards a common vision and purpose.

Skills availability across the board is a key issue in resolving and managing the present problems throughout the electricity supply chain including at the distribution level. We need an industry and supply-chain-wide co-ordinated and realistic strategy (without wishful thinking) on skills retention, usage, development and employment. The skills shortages and skills demands in the engineering sector are not confined to South Africa – it is a global shortage and demand problem. We are therefore competing in a global market place for these scarce skills and our strategies to both retain existing skills and attract additional skills need to reflect that.

Furthermore, organic skills growth takes time, and realistic and effective plans need to be implemented now, from the problems in the schooling system upwards into the tertiary level, and in terms of on-the-job training and mentoring.

The JIPSA approach clearly identifies three core strategies, namely to increase tertiary output, import appropriate skills and to retain current skills. The importance of the latter, to retain existing skills within both industry and the country as mentioned earlier in this document, cannot be over emphasized. We therefore need to be cautious about the signals we send and the policies we adopt, at a micro and macro level, if we want to attract and retain these mobile and marketable skills.

Clearly there are some challenges that urgently need to be addressed now, in order to encourage and nurture an interest in, and affinity to, science, technology and engineering amongst our youth. In a recent paper prepared by Prof Hu Hanrahan and others entitled “Engineering Education in South Africa: In fragile good health, denial or crisis?”, the need was clearly identified to “get them young”! This has a significant implication for not only educators in the schooling system, but for the professional institutes and engineering industry associations and bodies, to effectively and proactively market technical careers to our youth. This implies both a direct approach, as well as in indirect approach through the effective and very visible marketing of appropriate role models in the various communities.

Addressing these educational issues is however clearly a longer term issue and potential impact. The more pressing issue is how is the country and the electrical and distribution industry sector going to cope with the shorter term demands of the infrastructure development and maintenance this country desperately needs and which government has committed itself to deliver– the demands of the next 5, 10 and 15 years.

As noted earlier, it is clear that we are part of a global market for skilled people, particularly in technical disciplines such as engineering, and we therefore need to compete for these globally mobile skills in a global marketplace. In South Africa, we are not a special case that can expect special considerations in this respect. As in any market, we need to sell our pull factors and we need to minimise our push factors – not just to attract additional skills to come to South Africa, but to retain those we have. And– it is indeed about perceptions (as well as the hard reality). In the same vein, this principle is applicable on a micro-basis within the industry sector as well as on a macro and country basis.

Much has been made by many commentators of the principle of affirmative action and the need to scrap the policy in order to address the skills resources and operational issues. Finance Minister Trevor Manual commented on this last year after numerous calls for the suspension of affirmative action. In a rather interesting choice of words, he said that the intent of the Employment Equity act was “abundantly clear”, although he said it “was sadly abused in practice”. As Dave Marrs (the Cape Editor of Business Day newspaper) put it in an article in March 2007: “There is no need to scrap employment equity – just apply it fairly and sensibly as was intended”. He commented further that instead of being applied in a nuanced manner which includes previously disadvantaged people being given preference, but not to the exclusion of whites and without skills and skills requirements being taken into account, it has tended to become a non-subtle numbers game. This remains a challenge to be addressed.

In the electricity sector (and I suspect parallels can be identified in other engineering sectors including mining), the current trend of outsourcing within the electricity distribution (and other) sectors, whilst possibly being an effective <u>short term</u> solution, does little to empower the infrastructure owner, and enhances the risks of unreliability and failure in the longer term. Inadequate delegation of authority to outsourced consultants and companies, within the responsibility framework dictated by network operational and maintenance requirements, as well as health and safety issues (for one example as the responsible or designated person in terms of the OHS Act) poses a serious risk both to the outsourced resource and to the utility.

Furthermore, retention by the utility/network/infrastructure owner of the asset/engineering information and co-ordination and integration of the engineering activities is unlikely to be achieved because of the inherent underlying skills and resource shortages that necessitated outsourcing. It is therefore essential that electricity undertakings (and other engineering and infrastructure undertakings) have the in-house expertise to firstly manage outsourced work or services, ensure proper integration and coordinated implementation of activities including outsourced contracts, and to retain core levels of expertise and experience internally.

There is a large body of engineers no longer professionally active, or no longer active specifically in the electricity and distribution sector – the so-called "grey power". There have been some initiatives to bring them back into the private and public sector to assist younger and less experienced engineers, technologists, technicians and artisans in the short term, training them in the practical application of their skills, transferring knowledge and mentoring them. This concept and process needs to be encouraged and supported, actively marketed and made to be an attractive option.

The employment of such displaced or early retired skills is considered to be a viable option. There are however a number of issues that negatively influence this strategy, as well as the strategy of utilizing outsourced skills. These include, for example, issues around relatively onerous accountabilities and responsibilities for engineers in line functions within reporting structures that are misaligned, for example in terms of authority issues or where there is a lack of understanding of the engineering or technical issues. This can result, for example, in serious misunderstanding of the impact of, or delays in making, critical engineering decisions, with resultant risks and effects in respect of health and safety, operational and/or economic factors.

Effective mentorship must therefore be seen as a critical outcome of any intervention through employment of such skills. Mentorship must be a key deliverable and performance criterion in any such intervention, and indeed must be seen as a priority focus throughout the industry in general, and the resources of professional institutions and industry associations must be more effectively mobilized. The SAIEE for example, has established a voluntary mentorship programme whereby approximately 200 members presently volunteer to make their services available as mentors. Clearly this is just a starting point in setting up a sustainable programme, but points the way to what can and should be implanted across the industry.

Bursary schemes are important in respect of addressing the economic issues impacting on facilitating skills development and learning, and the SAIEE is proud of our long established bursary scheme which has grown in the past year to the extent that bursaries to the value of nearly R1/4 million were awarded, and a bursary administration service for industry companies has been implemented.

It is however an unfortunate reality that in many cases bursary schemes are ineffective in respect of the successful throughput. In a particular case study for a large municipal electricity utility over 3 years, 73 bursaries were offered to historically disadvantaged individuals (17 BSc Eng; 40 NDip Elect./Science; 13 Fin./Audit.; 3 other). Of the 57 'engineering team' bursars, 11 declined the offer or dropped out, 7 have completed their 3 year course of study and the remaining 39 are still studying of which 17 (approximately 45%) are expected to complete their studies. In summary, of the 57 potential engineering human resources offered bursaries, only 24 (42%) will probably be available to fill the skilled resource vacancies in the engineering team within that entity, assuming they are not offered or take up positions elsewhere. It is also pertinent to note, given the related comments elsewhere in this paper in respect of mentoring, a particular and further concern expressed at this utility in their ability to properly induct and mentor these new resources after graduation due to a lack of sufficient experienced engineering resources within the utility.

Furthermore, there is growing evidence to suggest that a substantial proportion of learners entering University engineering programmes do so because of the excellent bursary support they can obtain, although their real interest is not in engineering. As a result, many of these learners drop out, often after a few years in the programme.

The SAIEE has also noted a concerning decline in bursary applications received, from over 1500 applications in 2005 to around 50 for 2008. A declining trend in academic quality of applications has also been noted and indications from informal enquiries indicate that this is not a unique experience within the engineering sector. Clearly an intensive study of the bursary environment, and establishment of the key success factors and negative influences is required to effectively enhance the prospects of success for bursary students, particularly for students from less privileged and disadvantaged backgrounds.

The issues and problems around the learnerships that have replaced the traditional apprentice training must be urgently addressed. Particular issues include:

- Appropriate entry standards, coupled with effective application of aptitude testing, to enhance the probability of success and increase throughput.
- Establishment of appropriate and effective measurement standards. Industry sector feedback has indicated that the unit standards required cannot be effectively assessed in the workplace, and are also not applicable to some specific applications (distribution maintenance has been one example raised), requiring further development of customized training. Whilst such additional training is probably a generic requirement regardless, industry feedback is that the current situation is not effective. As an example, a particular case study at a major electricity distribution undertaking revealed that after ongoing attempts to make use of the relevant SETA skills product, this effort has been disbanded and a set of 20 incumbents is now being trained in-house.

Speculation that government is considering reviving apprenticeship training schemes as previously implemented are therefore encouraging. It is quite clear that a complete reassessment of the current approach and SETA structures is urgently necessary.

It is clear that that development of solutions to the skills crisis are a complex issue, demanding urgent and coherent strategic planning by government and industry, together with the educational and training sector.

But we should end on a word of warning: unless we can address the skills crisis, and by extension address the staffing and infrastructural inadequacies at many of our institution of higher learning, we are likely to lose the few dedicated educators we have. We will then most certainly not be likely to attract any others. This is a matter of national importance.

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