GROWING CIVIL ENGINEERING CAPACITY IN LOCAL GOVERNMENT

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ABSTRACT

The 2014 goal of providing housing & free basic services for every South African will be beyond reach unless concerted action is taken now. A recent survey has shown that 79 local and 4 district municipalities have no civil engineering staff and a further 38 local and 6 district municipalities employ only civil technicians below the age of 35! Project Consolidate, aimed at supporting fragile municipalities is set to tackle problems such as billing systems, municipal debt, free basic services and local economic development, but what of technical capacity building? This at a time when hundreds of technikon graduates are unable to find jobs.

The Local Government SETA (LGSETA), the South African Institution of Civil Engineering (SAICE) and the Department of Local and Provincial Government (DPLG) has recognised these problems and has put a number of interventions in place to:

- Offer technikon students experiential training with municipalities who have capacity to train young people, and contribute towards their stipends
- Make funds available to allow bright young graduates to continue with their BTech degrees in order to specialize in facets of municipal engineering such as roads and stormwater or water and sanitation
- Institute a system of mentoring / coaching for students and young graduates
- Register learnerships for training of operators of water care facilities.

The paper will explore each of these initiatives and will explain how local government can tap into the funds, capacity which is being identified and material being developed to help grow civil engineering capacity in local government.

1. INTRODUCTION

The Millennium Development Goals are clear. South Africa has committed to supplying basic water for all schools and clinics by 2005, basic water for all by 2008, basic sanitation for all by 2010 and electricity for all by 2015. The responsibility for this rests with local government and apart from electricity it is the civil engineering professional who must effect these outcomes.

2. LACK OF CAPACITY

The recent SAICE survey has highlighted a major problem in terms of the capacity to deliver. The civil engineering professional statistics are as follows:

No civil professionals

79 of the 231 local municipalities have no civil engineers, technologists or technicians
4 of the 47 district municipalities have no civil engineers, technologists or technicians

Only one civil technician

42 of the 231 local municipalities have only one civil technician
4 of the 47 district municipalities have only one civil technician

Only young staff

38 of the 231 local municipalities employ only technologists and technicians under the age of 35
6 of the 47 district municipalities employ only technologists and technicians under the age of 35

Only 70 with civil engineers

Only 45 of the 231 local municipalities have any civil engineers

Only 25 of the 47 district municipalities have any civil engineers

Further, local and district municipalities which did have civil staff reported that on average 35 % of the existing posts were vacant. Others reported that where there had been budgetary constraints vacant posts were removed from the organogram to balance the books. Still others advised that over and above the vacancies in existing posts, newly created posts could not be filled. Of concern was the fact that organograms in some municipalities made no provision for technical staff at all. This seems to indicate that vacancies would be in excess of 40 %. Metro vacancies ranged from 30 to 50 %. The average is considered to be at least 40 %.

Table 1: Civil professionals employed in all levels of local government

	Municipalities	Engineers	Technologists	Technicians	Total
District Municipalities	47	43	43	154	**240**
Local Municipalities	231	98	100	377	**575**
Metros	6	240	226	253	**719**
Totals	**284**	**381**	**369**	**784**	**1 534**

Of further concern is the number of vacancies in elementary and operator positions.

3. VACANCIES

These vacancies impact on daily operations, maintenance and overall service delivery, but more importantly in terms of Project Management Units (PMUs) the shortages of staff impacts on the ability to spend MIG funds allocated to deliver basic services. Many PMUs have only spent one or two percent of their allocations.

The survey carried out at the IMESA Conference in 2004 highlighted the following problems relating to vacancies or inappropriately qualified management:

- No land use planning
- No building control being done
- Lack of planning
- Lack of strategic direction
- Increase workload on others
- Unable to meet deadlines
- Unable to deliver infrastructure
- No maintenance, or only reactive maintenance when a crisis arises
- No in-house expertise for design or managing of consultants' work
- No in-house knowledge in terms of contracts and tender documentation
- No in-house expertise for interacting with contractors and the construction phase
- No in-house expertise to assist with practical issues or emergencies ….etc, etc

Given that the major function of a municipality is to deliver services, having allowed the huge build up of vacancies is a crime against the people and particularly the poor.

4. REASONS FOR VACANCIES

A number of factors have contributed towards the current crisis. These include salaries, re-grading, restructuring, lack of career development, early retirement and driving equity targets.

Salaries

In the previous dispensation, salaries were based on the size of the municipality, and that approach is still in place today. Unfortunately looking at salary surveys of the past, it appears that salaries in local government have been eroded by 18 to 20% relative to consulting since the mid nineties. This compounds the problem of low salaries in small centres. As a result the smaller municipalities, where the challenge to address poverty eradication is the greatest, are unable to attract suitable staff.

A recent advert called for an Assistant Director of a local municipality, who should have 'six years' experience, be technically qualified, act as Director Civil Services when required' at a salary of R 133 427 pa. This means that the person would have to have a minimum of 10 years education and training (four year degree or national diploma and BTech and six years experience). The same advertisement called for applications for a superintendent with four years experience at a salary of R 121 071. Whilst this may be low for a 'supe', the disparity between the qualifications and

two levels of responsibility is such that the salary of the former should be substantially higher. Clearly civil professionals in local government need to be far more highly valued in order to redevelop adequate capacity!

It is time that the concepts of scarce skills and rural allowances be introduced. Looking at advertisements from hospitals, after stating the salary (e.g. anaesthetist R 453 147, with six years experience) the advertisements continue with 'excluding Scarce Skills Allowance of 15 % and Rural Allowance of 22 %'. The salary for the Municipal Assistant Director quoted above would at least approach R 200 000 if scarce skills and rural allowances were added – an improvement, but still inadequate for that level of responsibility.

Re-Grading

Given that technical skills are of critical importance, the re-grading of staff nationally is becoming a problem for senior technicians. Grading systems do not place technical competence, responsibility or complexity of tasks handled in an appropriate position on the higher end of their scales. It appears that many experienced technicians have been dropped a level or two; hence they are leaving for greener pastures. The frustration levels in this regard were found to be high, regardless of age, race or gender.

If senior technical staff are correctly graded there would be no complaint about the salaries they command as they would align with other senior staff.

Solution 1 – Review conditions of employment

The value of technical staff cannot be overstated. Conditions of employment should be aligned throughout local government and should include alignment with the private sector.

Restructuring and lack of recognition of the need for technical skills

In the past the most senior officials in a municipality were the Town Clerk, Treasurer and the City Engineer. Today the mandatory positions are that of the municipal manager, chief accounting officer and chief financial officer. No senior technical staff are mandatory in organisations which exist to provide and sell technical services! Given that some 60 % of the municipal budget is spent on delivery, operation and maintenance of infrastructure, this does not make sense! Further in many instances the Technical Director position is also held by a non-technical staff member based on the premise that any one with management experience can manage anything!

This is resulting in less infrastructure being developed in real terms, due to the fact that most new managers are not experienced at conceiving projects, are not able to make decisions, or are often unwilling to take technical advice or listen to the experienced technical professionals in their departments. Many existing technical staff are leaving local authorities out of sheer frustration as they see their good work of the past being undone by those with no understanding or experience! These frustrations were expressed by the full spectrum of technical staff regardless of race or age.

The lack of understanding of the roles played by elementary workers, operators and artisans has also had serious consequences in terms of operations, as many water and sewerage works nationwide no longer comply with health and safety criteria set by the Department of Water Affairs and Forestry.

Lack of career development

The restructuring of local government has meant that in many instances civil professionals can never attain senior positions and have been moved from leadership positions to the 'boiler room'. Given that engineers and technologists have NQF 7 and higher qualifications, they represent some of the most highly qualified staff in local authorities and should be considered of great value in strategic positions and strategic thinking.

Junior staff are equally frustrated as few seniors have time to train them, so they are underutilised and do not build up enough variety of training to be able to register as professionals with ECSA (the Engineering Council of South Africa)

Early retirement

In the mid nineties, long serving staff at all levels of government were offered attractive packages to take early retirement. The theory was that this would create positions for black professionals. However, the overall profile of the civil engineering professional team was not understood at the time and there were insufficient numbers of senior black professionals to fill these posts. Not only have these retirements caused a major loss in terms of delivery capacity, but the knowledge that was lost has impacted on the progress of the young engineering staff who would have benefited from the supervision, coaching and mentorship that was in place in the past.

This problem was identified in the UK in the mid nineties and was captured in a discussion by Kevin Thompson[1], when he cautioned *'…by getting rid of older people an organisation's KNOWLEDGE is being lost, not just its people…'*

Another alarming phenomenon is now taking place. Terms of appointment are being revised in much of the public sector. Proposed changes in medical aid and retirement benefits will affect many adversely. In local government staff have been given the option once again of taking early retirement to retain all the benefits accrued to them. Senior staff are therefore planning to leave shortly, and juniors are looking at employment in other sectors, as the relative attractiveness of working in local government will further be eroded.

Solution 2 – Encourage staff to remain until normal retirement date or beyond…

Supplementary payments should be negotiated to encourage staff to remain until normal retirement date, and even beyond to act as coaches for young staff.

Equity targets

Despite being critically short of staff, most departments in all tiers of government and parastatals still rigidly attempt to achieve employment equity quotas in all disciplines. This results in one of two problems:

- Inappropriately qualified or unqualified staff are employed
- Posts remain vacant, despite the availability of suitably qualified and experienced applicants of all ages!

Considering that slightly less than 600 black civil engineers have graduated from South African universities in the past 40 years and a significant portion is in the private sector, there are few available to assume senior roles in local government!

Whilst the Employment Equity Act calls for selection on the bases of equity, it also calls for efficiency. Making choices purely on equity or representivity and not considering competence is proving counterproductive to the delivery process.

A real contribution towards transformation would be for all tiers of government to appoint the right person for the job, regardless of race or gender or disability or age, and to place responsibility on senior staff to once again supervise, coach and mentor the young so that they can benefit from the knowledge accumulated as a result of years of experience.

Says Mamphela Ramphele[2], the well known activist and World Bank managing director, *'…strict professional competence criteria need to be applied … to ensure efficiency and effectiveness…'*

By growing organically, the young generation will indeed be able to take their rightful places in time and address the current demographic imbalances.

5. ENGINEER TO POPULATION RATIOS – SOUTH AFRICA AND THE WORLD

In the industrialized world there is roughly one engineer for every 200 – 400 people. In the developing world one engineer services 500 – 1 500 people, whilst in underdeveloped countries the ratio is one engineer to 5000 people and more.

In South Africa there is one engineer to 3166 people. Clearly the country has too few engineers considering its development ambitions, its need to eradicate poverty and to take its place as a major player in the global village. Reducing job opportunities for those educated and trained in South Africa, as outlined above, and thwarting the opportunities for adequate training in local government is impacting negatively on South Africa's ability to grow.

Cyril Ramaphosa recently mentioned that if he could chose his career over again, he would study engineering, as *'…engineers are trained to work systematically, solve problems and get things done…'*

Solution 3 – Employ and utilise ALL staff available

South Africa has many problems to solve. We are too short of staff to base selections on anything other than qualifications, experience or competence. It is time to utilise the whole skills base to best effect!

6. EDUCATION OF CIVIL ENGINEERING PROFESSIONALS

Engineers

University training of civil engineers covers one year of basic scientific study, followed by three years of intensive study in all technical fields including structures, water, sanitation, roads, geotechnical and an introduction to environmental engineering and project management.

Technicians

By contrast, the technician receives one year basic scientific training followed by a year on site (known as experiential training or work integrated learning) and returns for one year to study basic structures, water, sanitation, roads, etc. This means that technicians generally perform well at the practical level, but lack the broad perspective in terms of planning and strategy that the engineer develops.

The number of technicians who graduate is generally limited by experiential training opportunities. Figure 1 shows how few final year technikon students in 2004 had been able to complete the experiential phase.

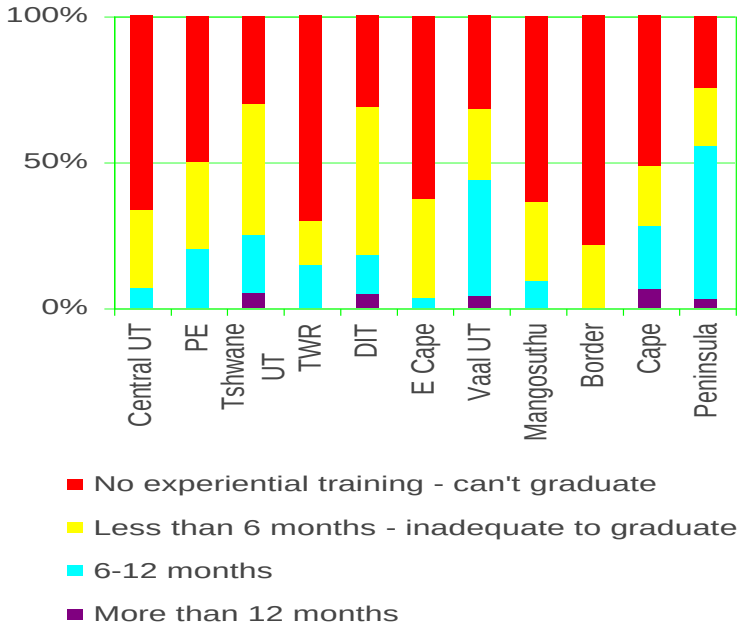


Figure 1 : Experiential training status of final year technikon students in October 2004

Solution 4 – Stipends sponsored by LGSETA

To address this problem, the LGSETA will support employers who take students on, by paying their stipends for the year. All municipalities are entitled to access these funds. The application form may be obtained from saice@ally.co.za, or collect one from the LGSETA stand.

Technologists

The introduction of the BTech degree has enabled technicians to choose subjects in which they wish to specialise. They return to technikon for a further 18 to 24 months mostly on a part time basis to specialise.

BTech graduates are highly sought after as they have specialist knowledge in a particular field and become specialist designers or leaders in these fields. A BTech qualification in water and sanitation or in roads is therefore ideal for staff working in specific departments of local government. Registered technologists are able to perform well in specialised fields and are considered to be as technically competent as engineers in that field.

At present nationally, 44% of civil engineering professionals are engineers, 12% technologists and the balance technicians. The number of engineers graduating annually has been declining for some 20 years. If the number is not dramatically increased, civil engineers will only represent 31% of all civil professionals by 2020. To address some of this shortfall the number of technologists need to be increased.

Solution 5 – BTech bursaries sponsored by LGSETA

To increase the number of technologists in local government, the LGSETA is offering bursaries for high calibre technicians currently employed in local government to continue with BTech studies. Application forms may be obtained from saice@ally.co.za, or collected from the LGSETA stand.

This approach will work well in most municipalities except perhaps the large local municipalities and metros where the complexity of the challenges will require an engineer with comprehensive education and training in all aspects of municipal engineering.

7. TRAINING OF CIVIL ENGINEERING PROFESSIONALS

The process

To register with ECSA as a professional engineer, the graduate must work for a minimum of three years to gain sufficient experience in all facets of the project cycle. After registration the engineer should have an all round knowledge of his or her chosen field. Registration is a useful measure for employers of the level of competence developed by the young graduate. Similar workplace training regimes are necessary for registration as professional technologists and technicians.

It was clear from research that there is a general lack of knowledge in local authorities of ECSA's requirements for professional registration and the benefits. In addition there appears to be a lack of motivation and resources to provide the appropriate workplace training and range of experience required for registration. In particular, the lack of technical staff and high level of vacancies means that those currently employed in local government simply do not have time to train young graduates.

Recognition of the process

Most senior civil engineering respondents agreed that professional registration was important and that registration should be recognised and rewarded by means of a salary increase or promotion. The exact opposite view was held amongst senior non-technical management, councillors, politicians and human resource departments. Only 40 % of the local municipalities, 45 % of the district municipalities and 55 % of the metros indicated that they offered training for young graduates to become professionally registered with ECSA.

Although nearly 50 % said they provided workplace training, only 15 to 30 % supervised or checked the graduate's work and provided a mentor, whilst only 16 % in local and district municipalities moved graduates from one department to another to gain all round experience. The metros put much more effort into 'hand holding' and moving staff from division to division.

Knowledge transfer

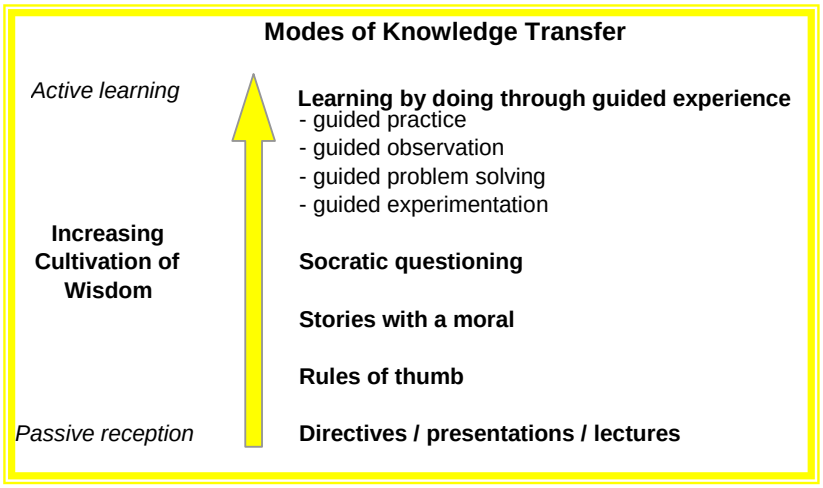
One thing that all experts have done is to practice. In the book 'Deep Smarts' written by Professors Dorothy Leonard of Harvard Business School and Walter Swap of Tuft University[3], it is argued that the amount of practice is not a predicator of expertise, but extended periods of concerted effort with self-reflection builds expertise.

They have coined the phrase 'Deep Smarts', meaning the ability to make smart decisions about complex situations, a characteristic all wish to see in their staff. This cannot be learned from PowerPoints or Best Practice websites, but from 'Knowledge Coaches' – experts who are motivated to share their knowledge or 'deep smarts' with their protégés. The coach or supervisor acts as a teacher who transmits experience-based expertise.

Their view is that whilst all methods of learning shown in Table 2 are useful, the less interactive modes transfer much less real knowledge than those involving interaction and guided experience. Since the human brain remembers something longer if it struggles with the topic before finding the solution, experiential training under the guidance of an expert, or knowledge coach is far more beneficial than attending course after course.

With the introduction of the SETAs, many organisations are complaining that there staff are always on training, but have not developed the competence required. Table 2 explains why this has happened. The development of deep smarts requires a mix of the above activities and the availability of experts to manage the guided experience process.

Table 2: Modes of knowledge transfer



The learning process during the candidate phase lends itself to registration as a learnership. This will allow employers to claim funds from SETAs for employing external capacity to train and mentor young graduates where internal capacity is not available.

Solution 6 – Candidate training process being registered as a learnership by ECSA

Work is currently being carried out by ECSA to develop qualifications and generic learnerships covering the candidate phases for Pr Eng, Pr Tech Eng and Pr Techni. Discipline specific material will need to be developed for every field as a guideline to both the supervisor to ensure adequate career path planning, and for the graduate to ensure that appropriate training is being given. Volunteers are required to help develop curricula and material for learnerships in local government. Contact allyson@ally.co.za

The seven and ten year rules

The candidate phase is however, only the beginning. Studying the DotCom bubble, Leonard and Swap conclude that the failure of companies was due to the inexperience of the young technology whiz kids who headed up the numerous hatchling companies at the dawn of internet trading. They have also traced many other failures and catastrophes to youthful management and inexperienced technical personnel.

Their view is that developing competence in complex processes and takes about five to seven years. Expertise, however, takes about 10 years! They state,

'…most evidence suggests that it takes at least ten years of concentrated study and practice to become an expert. The ten-year rule places some inescapable limitations on the development of expertise in management or any other knowledge-based, complex domain, limitations that are frequently ignored or minimized by those trying to accelerate the process…'

From the research it appears that coaching and knowledge transfer is lacking. Even with the best career development plans in place, competence only comes with technical experience and input. The first major wave of retirements commence in 2009 as the 'baby boomers' reach 63. It is essential that senior, soon to retire staff to be retained and retired personal be redeployed to carry out the supervisor/coach role where production staff are too busy or not available develop young people. It is a long process and all with knowledge to transfer must urgently be harnessed. SETAs should set funding aside for this type of skills development.

8. TO ADDRESS THE LACK OF CAPACITY

Clearly not only is delivery of basic infrastructure a problem, but operations and maintenance have now also reached crisis stage. It is essential that civil engineering capacity be rebuilt in local government.

Umaluleki – the advisor

The civil engineering age profile is such that there is a large group of senior engineers nearing retirement age, few production staff in the mid career age group and many young people requiring comprehensive supervision, training and experiential training opportunities. To transfer knowledge, senior engineers and those who have recently retired need to be deployed as 'knowledge coaches'. Their role will be to initiate projects, delegate the tasks to young graduates and supervise/coach them in the process so that they build up expertise in local government and can eventually register and

progress through the ranks. The '*Umaluleki'* (advisors) are needed before it is too late. In the cultural context *Umaluleki* refers to 'the old who always advise the young'.

Solution 7 – Place at least 500 more civil professionals in local government

Teams need to be constituted to carry out the work per district, municipality or department as follows:

- A senior professional to initiate projects, supervise and coach junior staff according to a structured training programme
- Two graduates requiring candidate training, who will carry out the work under supervision
- Two students requiring experiential training who will assist and learn from the graduates and seniors.
- Funding for students and senior professionals has been committed by among others the LGSETA and the Umsobomvu Youth Fund. More funding is required. If council have funded posts and cannot find suitable staff they should also participate in this project.

9. OPERATIONS

Operations have also become a problem in local government. As with contractors, the number of artisans rising in the ranks has reduced, and there is a dire shortage of adequately trained staff capable of operating essential plants such as water purification and sewage treatment works. Without senior civil engineering professionals in councils to manage these aspects, there is no one ensuring that operators are adequately trained, and no one monitoring the correct operation of these essential services. Some of the roles and responsibilities of the professional engineer in terms of the Health and Safety Act and Regulations include *'…engineers have a legal and moral responsibility and should advise clients accordingly. They must among other things:*

- *Carry out sufficient inspections at appropriate times to ensure compliance with the design*
- *Keep a record of those inspections…'*

With no engineers in place, there is no capacity to fill in for inadequate operators. It is essential that staff be hired and trained to manage the many plants nationwide.

Solution 8 – Operator learnerships being developed and funded by LGSETA

Water care learnerships and training material is currently being developed to train a new breed of operators. For more information visit www.lgseta.org.za or contact saice@ally.co.za,

10. NUMBER AND NEEDS

Much of the material presented has been published in the book Numbers and Needs : Addressing imbalances in the civil engineering profession[4], which is on sale from SAICE. To develop a specific local government document to give direction to politicians and decision makers, and make staff available council by council, more input is needed from each municipality on actual qualifications and level of experience required. Please visit the LGSETA/SAICE stand and fill in questionnaires to assist with the recapacitation process.

11. CONCLUSIONS

Huge gaps have developed in civil engineering capacity in local government. The eight interventions suggested above are a start to addressing the problems. Input will be welcomed on how best to structure these and on any other interventions which could assist with reversing the devastating effects caused by the loss of local government capacity. Please contact **Allyson Lawless** or **Janet Davies** to discuss your ideas.

12. REFERENCES

[1] K Thomson, *Passion at work*, Capstone, Oxford, 1998, p 53.
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