IMPROVING HUMAN RESOURCE CAPACITY FOR ROAD NETWORK PRESERVATION

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Abstract

There is compelling evidence that a significant factor contributing to the poor condition of much of Africa's rural road network is inadequate human resource capacity. This shortage of professional skills in road engineering inhibits proper management of road networks leading inter alia, to many hundreds of millions of Rands being incurred as excess road user costs by the populace, as well as greatly increased risk of road crashes.

For more than fifty years, since 1952, the South African Road Federation has been active in the development of human resource capacity in the roads field and currently holds more than thirty courses annually on many aspects of road engineering and management directed towards improving the road network. SARF has held more than 210 courses since 1960 with more than 12 000 delegates having attended these courses. (SARF archives)

This paper examines the extent and consequences of this lack of capacity in respect of the preservation of the road network in general, and in relation to this conference, road asset management systems in particular. It also describes the actions of the SARF over decades in attempting to assist in resolving this issue.

1. INTRODUCTION

There is compelling evidence that a significant factor contributing to the poor condition of much of Africa's road network is inadequate human resource capacity. This shortage of professional skills in road engineering and related infrastructure within road authorities and municipalities inhibits proper management of road networks leading to major wasteful or non-expenditure of funds allocated to road infrastructure. (DBSA intervention in supporting municipalities through seconding and training technical and financial prospective managers).

These lost opportunities of not managing our road infrastructure adequately are felt by the road user in high costs and an increased risk of poor road safety witnessed by road crashes affecting both the population and also governments through the fiscus. Road accident funds are inevitably in deficit on their budgets as witnessed by our own South African Road Accident Fund yearly budget shortfall.

Another major loss caused by lack of capacity is the lost opportunity for timely maintenance, since the road could have been repaired when there were only minor cracks. Sealing would have been significantly more cost effective. Our under-resourced road authorities end up spending between 5 and 12 times more than would have been the case if proper routine maintenance and asset management has been done timeously. (Sampson, 2008).

For effective and efficient road maintenance to take place it requires timely identification of problems and careful planning and scheduling to ensure repairs are done in a timely and cost effective manner. The road maintenance requirements become even more complex as activities to be carried out increase and are not carried out on time.

The present state of most road authorities in South Africa in respect of skills and technical capacity is such that these requirements are not being met, hence the need to rectify the situation by various interventions, such as the timely recruitment of skilled personnel, training, incentives, skills transfer, etc.

2. CURRENT SITUATION AND CHALLENGES

The current situation in most of our African roads as a whole is not acceptable. We will however only focus on the current South African situation with regards to enhancing the capacity of road authorities, with accent on provincial road authorities, metros and municipalities. The Skills Development Act (Act 97 of 1998) that was been passed in the South African parliament in 1998 and was amended in 2003 and 2008 deals with the constituting of bodies such as the National Skills Authority (NSA), National Skills Fund (NSF) and Sector Education and Training Authorities (SETA). The Act promotes learnerships across the SETA specific sectors. Roads fall under the Construction and Education Training Authority (CETA).

The Act also enforces the submission of work place skills plans (WPSP) and skills programmes of which a portion of the skills levy is refunded on submission of a WPSP and thereafter another portion after the submission of the skills programme report. Most large and smaller companies are complying with the requirements of the Act, but the challenge comes with implementation and monitoring of the programmes that are embarked on and the impact they are making. A number of interventions by DBSA, TRANSNET, Provincial Authorities, some Metros and Municipalities, and organizations such as SAFCEC, SAICE, CESA, CSIR, SABITA, C&CI, AsAc and SARF are involved in skills development with visible results. We also have many individuals such as Alyson Lawless who are committed to the research and documentation of the development of civil graduates and who are making a significant contribution to the development of engineers and the industry as a whole. (Lawless, 2005; Lawless, 2008)

In addition, a programme to accelerate the skills development in various areas was championed by the then Deputy President Mlambo-Ngcuka. The 'Accelerated and Shared Growth Initiative for South Africa' (ASGI-SA) also places much emphasis on skills production and acquisition. Skills acquisition initiatives and programmes, mainly under the auspices of the Joint Initiative on Priority Skills Acquisition (JIPSA), are also being fast tracked in South Africa.

Some of the key challenges faced by municipalities and road authorities are as follows (AkhaTech feasibility study, 2007):

- There is a wide succession gap (between senior and junior technical staff) in terms of experience, skills and age differential;
- In most institutions more than 60% of the technical qualified staff with experience are 50 years old and over, and more than 35% are 55 years and over;
- There is scarcity of experienced staff across all spheres of government;
- Employment equity is a major challenge in most of the municipalities and road authorities' at all technical levels for women and blacks, in respect of professionals, technicians and associate professionals, craft and related trades workers, and plant and machine operators and assemblers.
- There is a lack of focused programmes for continuing professional development and registration with ECSA and coordinated further education and training of technicians.

The lack of a clear mandate to focus on producing engineers within specific disciplines especially the roads sector is of concern to SARF and many professionals. We have had a situation in the 1960 – 1980 when the government of the day decided to produce engineers at a rate never seen before and the use of government departments and state owned entities as training ground for these young engineers (ECSA, 2010)

3. HISTORICAL COMPARISONS

Since the new democratic dispensation in 1994, there has been much talk, but no clear direction on what programmes are to be put in place to meet the human capacityshortfall in the field of engineers and technologists. We, as a country, have lost a number of experienced engineers to other countries due to the dynamics of change. Also those who felt uncomfortable with the new government left to other countries. These engineers have been trained right here in South Africa and are sought after by many countries.

There is a need to produce more technicians and engineers in South Africa and Africa as a whole. The present statistics are a shame in respect of what the country puts in and what the country gets out, since as only 18% comes out at universities within South Africa in engineering studies.(University of Technologies and University output reports consolidated)

According to Lawless (2005), between 4 000 and 6 000 additional civil engineering professionals are required in South Africa. Our ratio of engineers to population is a major challenge as we are behind even developing countries like India. Table 1represents an extract from a table in Lawless (2005), which compares the population per engineer in many countries.

Table 1. Comparison of population per engineer in selected countries

Country	Ratio of Population per engineer
USA	389
UK	311
India	157
Brazil	227
China	130
South Africa	3 166

As witnessed from Table 1, the ratio of population to engineers is significantly lower than various other countries. A comparison with other developing and developed countries suggests that South Africa is far behind. Western Europe and North America have an average of between 150 and 300 people per engineer. It is discomforting to note that both China and India are also in that company. South Africa has only one tenth of the engineers of those nations; therefore our needs are far greater than we can imagine.

The challenge also comes when graduates cannot be engaged in activities as outlined within the ECSA guidelines of relevant work and responsibilities within the design, contract administration, measuring, and commissioning and maintenance areas.
Table 2 shows how slow the process of developing engineers within South Africa has been from 1994 to 2004. It is also suggested that in the rest of Africa the situation is not that different, and is probably worse.

Table 2. Number of engineers per population group: 1994 to 2004.

Group	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Asians (A)	76	113	111	161	171	161	175	169	137	172	188
Blacks (B)	102	106	120	197	214	267	292	313	388	626	688
Coloureds (C)	10	16	7	16	21	35	39	38	54	45	31
Total: A, B & C	**188**	**235**	**238**	**374**	**406**	**463**	**506**	**520**	**579**	**843**	**907**
Whites (W)	1370	1528	1359	1459	1432	995	802	832	1011	1086	940

Source: ECSA (Annual Reports information on registered engineers collated)

The most recent statistics of registered professionals in South Africa is shown in Table 3.

Table 3. 2008/2009 Registration statistics of engineers in South Africa

Category	**Number**
Professional Engineers	14 474
Candidate Engineers	4 330
International Professional Engineers	19
Professional Technologists	3 244
Candidate Technologists	1 357
Professional Technicians	1 887
Candidate Technicians	1 745
Professional Certificated Engineers	998
Candidate Certificated Engineers	184
Registered Lift Inspectors*	160
Registered Lifting Machine Inspectors*	556
Registered Engineering Technicians+	936
Registered Eng Technicians(Master) +	441
Total	30 331
Note: * Specified Category + Categories defined in previous Act, now	

Source: ECSA Annual report 2008/09

There is a need for a clear strategy and plan to address the necessity for the training of qualified technicians, technologists and engineers in order for them to gain meaningful experience that they can use to improve the condition of road infrastructure and other infrastructure in the countries in Africa. The same applies to ‘road builders’, we are losing the skills as the ‘old guys’ are getting to a stage where they can no longer do much. However it is

not too late as we can use them to impart knowledge and experience to the young in all streams of engineering.

4. A SKILLS TRANSFER SOLUTION IMPLEMENTATION STRATEGY

There is a need for intervention on a large scale to allow for pass rates to improve and post-graduate programmes for technicians, technologists and engineers to achieve professional status within a reasonable time of 4 to 5 years after graduation. There is also a need for mentoring. The relationship between mentor and protégé must be natured to make sure the programmes are a success. Also our ratio of engineers to the population is far from being realistic and hence the need to entice school children to be interested in maths and science at an early stage in their education. Achieving the targets of output of the desired number of graduates is critical.

Coordinated skills development programmes, as part of a multi-prong strategy should be implemented;

- To make engineering profession a career that is more attractive in terms of remuneration and other conditions of service. Engineering graduates are highly sought after by other economic sectors such as legal, marketing, information technology and financial/accounting businesses.
- Promote skills and experience profiling to identify skills gaps at the beginning of each training programme in the form of interviews with individual staff with these findings informing the training programme and strategy.
- Promote robust workplace training and value of experience in engineering profession and artisan skills which should be major draw cards to retain existing staff and attract new talents.
- Through sustained effort by municipalities and road authorities to ensure graduate engineers, technologists and technicians get appropriate practical training to achieve registration with ECSA upon completion of their training period.
- Providing clear guidelines for the transfer of knowledge and skills should be established before implementation of any training programme.
- Training Programmes should incorporate monitoring, evaluation and feed back to ensure timely corrective measures are taken where necessary.
- The two-way protégé and mentor relationship should be enhanced to sustain a sense of belonging and its associated attributes such as motivation through challenging work, recognition for good performance, opportunity for advancement, encouragement and guidance where necessary.
- To offer attractive remuneration and other conditions of service including conducive work place environment to be able to attract and retain suitable staff.
- To maximise the use of projects at hand within the municipalities and road authorities to ensure training and development including mentoring and coaching is effective by:
    - extending the use of the training-of-trainer programme and their application in the field;
    - delaying the exit of some of the staff who have reached retirement age and who are willing and able to assist, and
    - engaging retired staff on a contract basis as a short term measure.
- To those identified graduates who are developable to managerial levels in the near future, there is a need for an accelerated training and development programme for the young men and women assisted by internal and external mentors and coaches as appropriate.
- Training should allow for multi-skilling strategy to the extent possible to improve staff employability and mobility within the labour market. On-the job-training of the technicians should take place at three levels:

- at the lower level by the Road Works Foremen and Road Superintendents through practical hands-on experience on maintenance and repair of road infrastructure.
- at the mid level by other more experienced technicians and technologists, and
- at the higher level by experienced engineers on the planning, design, construction and maintenance of road infrastructure.

- To promote compliance with employment equity requirements, taking into account that a large proportion of the designated groups is concentrated in the lower skilled and semi-skilled categories of employment, and there are very few female workers. .
- Municipalities and road authorities should have a retention policy and strategy which needs to be implemented to ensure recruitment, development and retention of suitably qualified staff. The implementation strategies should include a five year skills development plan.
- There is a need for cooperation among technical, corporate, human resources and finance directorates and departments associated with development of technical skills.

(AkhaTech's experience with Transnet in implementing their technical skills development programme 2002 - 2008)

5. CONTRIBUTION BY THE SA ROAD FEDERATION

SARF is playing its part through offering more than thirty courses annually at various centres throughout South Africa and Namibia and have received requests from Botswana, Zambia and Tanzania.

Table 4 and Figure 1 show the significant growth in the number as well as attendance of SARF courses during the period 1997 to 2009.

Table 4. SARF course statistics, 1997 to 2009

YEAR	Number of Courses	Number of Venues	Number of delegates	Average no. of delegates/course
1997	3	6	221	37
1998	6	11	244	22
1999	5	12	263	22
2000	7	14	285	20
2001	9	9	222	25
2002	9	12	313	26
2003	9	10	256	26
2004	11	13	307	24
2005	9	12	407	34
2006	10	14	601	43
2007	12	19	785	41
2008	15	29	1153	40
2009	17	32	1039	32

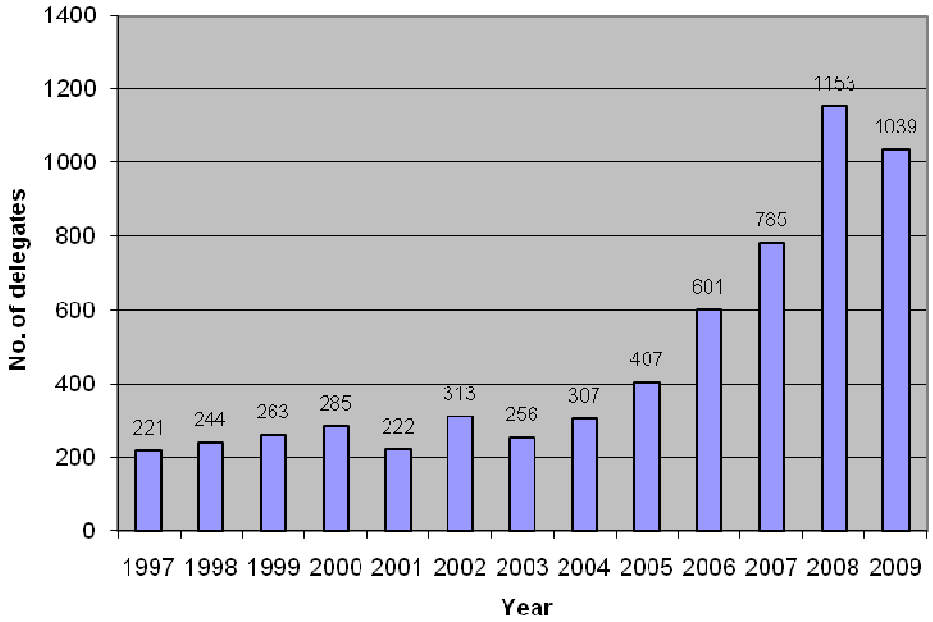

Figure 1. SARF course attendance, 1997 to 2009.

SARF also runs seminars and conferences such as the regional conference we are having now to share information with all road and transport stakeholders. SARF will continue to do its part and invites other role players to join us in improving the skills base of our technical resources within the road and transport sectors.

SARF has taken the lead by bringing the road industry players involved in training together through CapCor (Capacity Coordination Committee), members include the Road Pavement Forum sponsors (ASPASA, C&CI, CSIR, SABITA, SARF, SARMA AND SAT), DOT, SAICE, SAFCEC, Universities Representation, AsAc, etc. Other players identified will be invited to future meetings and include CESA, University of Technologies representative, FET Colleges representative, CIDB and CBE.

6. CONCLUSIONS

The lack of production of technicians, technologists and engineers within the roads and transportation fields is an emergency that cannot anymore be ignored. These graduates need to be given opportunities to gain meaningful experience in line with the ECSA requirements for candidate registered technicians, technologists and engineers.

A process of developing technicians/technologists and engineers in line with the ECSA requirements needs to be embraced and implemented using available projects within road authorities and promoting mentorship by registered professionals. We should utilize retired individuals who have the necessary experience as far as possible.

We need more people to be involved and government, through the road authorities, should also commit themselves to work hand in hand with organizations that are doing something about the backlog. At SARF we continue to make a significant role with regards continuous professional development and the sharing of information for our members and the roads industry as a whole.

Continuous professional development and information sharing with graduates and the industry as a whole is also an integral part of keeping the industry players informed and updated. SARF will continue to broaden the course material to reach more industry players through courses, seminars and regional conferences in contributing to the industry.

SARF will also continue to bring all stakeholders in industry to align with each other in sharing information and empowering each other as organisations to make a meaningful contribution to the roads industry.

The commitment to achieve more is required from the relevant leadership in the country as well as the road authorities to ensure the roads are considered as critical assets to the development of the country and economy. We can confirm that as SARF the partnership with Department of Transport and Road Agencies and Authorities as well as other organisations as shown by the partnership in capacity coordination is starting to work.

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