

ID 093: A Skills Intervention Analysis

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Abstract

This paper offers a proposal for a new practice theoretical approach to the research agenda. It discusses some The paper describes a research project which, using a sample of water sector institutions, aimed to determine the gaps between the skills required (technical posts only) to perform the service delivery function of each institution, and the gaps between the requirements of these technical posts and the actual skills of the incumbents in the posts.

Innovative aspects of the research included the development of:

- a Water Sector Competency Framework, which is a structured table of over 2500 skills required in the sector;
 - a method to determine the staff per job title required in each of four types of water services institutions, based on technical criteria of the nature of work and the extent of the responsibility of each of these types of institution; and
 - an online qualitative skills audit questionnaire for individuals to rate themselves against the skills in the Competency Framework.
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Problem statement

It is generally accepted that South Africa (SA) does not have sufficient skills to plan, build, operate and maintain service delivery infrastructure such as public transport, water and sanitation, health and education facilities, harbours and airports, and public buildings. For example, when electricity supply fails, or water does not flow, or sewage overflows into the streets, one reason usually advanced is that there is a lack of skills in the municipality or other institution managing these services. (SAICE 2017.)

In response to its own experience that the public water and sanitation sector (hereinafter referred to as the “water sector”) does not have all of the required skills necessary to plan for and maintain the supply of services to the public, the national Department of Water and Sanitation (DWS) commissioned the Water Research Commission (WRC) to investigate the nature and extent of the lack of skills in this sector in SA, and to develop a methodology for a pilot ‘skills intervention map’, based on a sector skills gap analysis, to meet the requirements of the public water infrastructure sector.

The motivation for this initiative lay in a perception by DWS that:

- there was no standardized /uniform approach and methodology of conducting skills audits in the sector – but there is a need for such an approach and methodology;
- human resources (HR) departments in water sector institutions only to a limited extent recognised the need for skills audit interventions (and seldom conducted skills audits of any shape or form);
- the water sector lacked a coordination point for sector skills development (audit, planning, funding, implementation, monitoring and evaluation); and

- there existed limited alignment between audits, on the one hand, and current plans for water sector skills development on the other.

This kind of skills assessment is seldom done in the South African public sector. Furthermore, when it is done at all this is usually by HR staff or by consultants who do not possess sufficient ability for the task – especially they lack the required specific understanding of the skills and experience needed to plan, construct operate and maintain the infrastructure.

The long-term wish of DWS and WRC is to:

- Attract and retain skilled staff in the public water sector institutions.
- Monitor and proactively respond to emerging market forces and sector skills needs (sector intelligence).
- Identify existing technical skills gaps, as a first step to addressing them.
- Improve planning and design of water sector skills at all levels.
- Align the sector skills development strategy with the sector strategy (i.e. the National Water Resource Strategy) and country strategy (i.e. the National Development Plan) by means of audits every five years.
- Document lessons and share best practice.

Objectives

The specific objectives of the research project entitled “An Integrated Water Sector Skills Intervention Map Based on a Sector Skills Gap Analysis”, were to:

- Discover and review completed work relevant to the sector on the needs and status quo of human capacity and competence, and identify the information and knowledge gaps.
- Complete a sector-wide quantitative and qualitative skills audit, including the current sector skills requirements within the various institutions.
- Determine the scarce, critical and priority skills gaps for the different skills sets and skills areas of the water sector and prioritise them into immediate, medium to long term priorities.
- Develop a high-level water sector skills intervention map which includes:
 - A summary of the skills gap analyses, needs, interventions and recommendations;
 - Resources and support systems required;
 - Define roles, responsibilities and targets.

Definitions

What could be meant when it is loosely said that an institution ‘lacks skills’? A comment such as this does not inform the hearer whether:

- the institution lacks skills due to posts not being filled or
- posts are filled, but incumbents lack the ability or skill to do the job or
- the posts are occupied by people who have the skills specified for those posts, but those skills specifications – and/or the way the people who occupy them are deployed, and/or the organogram of the institution – are inappropriate for the responsibilities of the institution.

In order to differentiate, this paper uses the following terminology:

- *Skills* is used to refer to the competency of an individual, attributable to his/her formal training, prior learning and experience (e.g. an ability to calculate water demand, ability to analyse microbiological samples, ability to maintain a telemetry system and appreciating the information it is supplying, ability

to operate and maintain sludge pumps (i.e. pumps which can cope with a spectrum of liquid through semisolid substances).

- *Capacity* is used in the context of the type and number of staff types required
 - in the first instance by job title on the approved organogram tuition (e.g. ten plumbers, one hydrologist, four water resources planners), and
 - in the second instance by the number, qualifications and experience of staff required in terms of the actual responsibilities of the institution.

With regards the last of these points, it is important to clarify the extent to which the organogram is suited to the institution's set of responsibilities. For example, given the wastewater which must be treated and the treatment infrastructure in place, does the organogram identify sufficient numbers of, and appropriate levels of qualification for, skills sets including the following: process controller, millwright, and general worker?

Methodology: Overview

To represent the entire public water services sector in South Africa, the project investigated approximately three dozen water sector institutions (WSIs) of different functional types – also of different sizes and different levels of competence. For each of these institutions, it reviewed WSI legal mandates and the extent of responsibility per mandate. This focus enabled a calculation of capacity requirements with regards to staff types, and then, per job title, numbers and experience of staff. From there it moved to determining suitable organograms, the number of posts per job title, and the percentage of these posts that were filled and vacant. Then, using a sample of five representative public service WSIs, it determined the gaps between the skills required for technical posts as per job titles on the current organogram on the one hand, and on the other hand the actual skills of the incumbents in the posts.

The research project developed and initiated, and for the duration of the project administered, an online staff skills audit survey system that provided a live and repeatable process for measuring individual skills, and which could be (and was) rolled up to an institutional competence level.

The most detailed capacity and skills assessments were carried out on five WSIs, viz:

- DWS;
- a catchment management agency (CMA);
- a water board; and
- two water services authorities (municipalities or groupings of municipalities).

These five detailed assessments are referred to as the “Level 1 assessments”. The paper also summarises findings from the “Level 2 assessments” of 18 WSIs, at least one in each of the nine provinces, conducted on-site. These assessments included both general human resources (HR) and water-specific technical quantitative surveys, wherein the relevant information to verify the responses was gathered in documentation form and studied by the research team. The Level 2 assessments did not include the capacity and skills audits of the Level 1 assessments. The Level 1 assessments also gathered other information of a Level 2 nature – for example on the extent of outsourcing of work – as described later in this paper.

A further 21 WSIs – the “Level 3 assessments” – were interviewed telephonically using the same survey that was used for Level 2. The main difference between Level 2 and Level 3 was that the level 3 WSIs were not asked to provide evidence in support of their responses.

This research only considered public WSIs. Within the WSIs only technical positions were assessed. While the designers of the project acknowledged that shortfalls of non-technical skills (e.g. finance, HR) in a WSI could also seriously hamper service delivery, for budget reasons the surveys excluded all but technical staff. Furthermore within technical water departments only semi-skilled and skilled staff were assessed – general workers, who make up on average half of the staff complements, were excluded.

Methodology: Detail

Literature review

For the review of existing or completed works on capacity and skills relevant to the water sector, of the order of 60 documents were consulted, and numerous telephone and email queries were made. A two-page review was written of each document under the following headings:

- summary of the document
- summary of information relevant to skills development in the water sector
- analysis of information and/gaps specifically relevant to this project

In nearly all cases, it was found that the documents only touched the tip of the iceberg with respect to skills audits, and none of them provided much in the way of guidance as to how this is to be accomplished for the water sector in South Africa. (WRC 2011) ‘This is where the project will make a significant difference and add value to the sector by establishing a live, interactive audit process’. (WRC 2014, page 36)

When undertaking the literature review, it was soon found that the usefulness of much material discovered was limited. For just one example, Australian documents use the term “skills audit” in terms of numbers of people employed, as contrasted with vacant posts – a far too simple approach to be of much value to the project. Realising that the literature review was providing little return on effort, the consultant team and the client agreed that searching should not proceed further. The need for skills audits was obvious enough, and the team was deemed more than competent to undertake the main labour of the project – viz discovering place-specific skills needs and the person-specific skills sets to hand – then evolving analysis techniques, and performing the analysis. Hence the team was willingly given the go-ahead to expend most of its effort on this work.

Confidence in the team was not misplaced. It was later noted that the project could only have been executed by a strong team which included water and sanitation experts and human relations experts, with highly competent IT skills at hand – which the consultant team possessed.

The Level I Capacity Gap Assessment

The *capacity gap* is the difference between the demand for capacity and the supply of capacity. Determining this capacity gap is more complex than it might at first appear.

The process of determining the *demand for capacity* in WSIs began by analysing their mandate as defined in relevant legislation – in this case, particularly the National Water Act (No. 36 of 1998) and/or the Water Services

Act (No. 108 of 1997). These mandates were mapped onto the institutions' organograms, and then to individual job titles. Once the mandates were mapped, together with the physical dimensions of the tasks involved in carrying out these mandates, experienced engineering personnel on the project team calculated the time it would take to deliver on the mandates. The detail as to how often tasks related to a mandate would occur in a year, along with the time in days to perform that task once, was drawn from the aforementioned experience. The total time in days per annum to deliver on mandates would be the product of the number of tasks multiplied by the time to perform the task once. This time was divided by 220 working days per annum to determine the number of staff required per job title.

In addition to looking at demand for capacity based on extent of responsibility, the project also looked at demand for capacity from a qualification, recognised prior learning and years of experience point of view. The minimum qualification requirements and years of experience for full competence were obtained from job profiles.

The process of determining the *supply of capacity* in WSIs began by analysing existing organograms along with staff data tables exported from the relevant HR Management Information System (HRMIS) or hard copy file obtained. Information sought included department, job title, whether a position is vacant or filled, incumbents' gender and race, and qualifications. The staff list, itemised by staff member, was aggregated to provide the final figure of the number of staff per job title.

The *capacity gap* in WSIs was then determined by taking the demand for capacity and subtracting the supply. This gap was presented graphically for all job titles and/or mandates.

The above capacity gap assessment was applied to five WSIs. It returned reasonable results for the capacity gap at four of them, the exception being the water board. Here it returned a lower number for staff required than the water board actually employed, and thus a negative capacity gap. This led the researchers to recommend that further work be undertaken with other water boards to establish appropriate staffing norms (i.e. the number of staff per job title per unit of measure of work) for these WSIs.

Applying the capacity gap assessment to the CMA and the least capacitated of the water services authorities returned the following results:

Institution	No. of technical staff required	No. of technical staff available (all)	Capacity Gap	No. of technical staff with minimum qualifications	Revised Capacity Gap
CMA	16	9 (56%)	7 (44%)	9 (56%)	7 (44%)
Water services authority	82	34 (42%)	48 (58%)	6 (7%)	76 (92%)

Given the capacity gap from which this particular water services authority suffers, it is remarkable that it is able to provide any kind of service at all. And indeed it is a poor performer as measured by service delivery

indicators. (DWS 2014, DWS 2015a and 2015b) Regrettably, a significant number of other WSIs are not much better off. Not surprisingly, therefore, taking a nationwide view:

‘By 2016, 86.51% of households had been provided with basic (RDP) level of water supply infrastructure. However, not all of the infrastructure was able to meet the level of assurance (reliability) of supply requirements, defined for a basic water supply as interruptions of <48 hrs at any one time and a cumulative interruption time of <15 days over 3 months. If this reliability requirement is taken into consideration, then the 86.51% value is reduced to about 69%.’ (DWS 2017, page 31)

The Level I Skills Gap Assessment

A Skills Matrix is an assembly of all required skills per job title in one spreadsheet. The *skills gap* is the difference between the skills requirements of the institution (as per the Skills Matrix) and the actual skills held by staff (from the online skills audit). In other words the skills gap would be the difference between the demand for and supply of skills.

The project team early on realised that a structured table of skills required in the sector – which table the team dubbed the ‘Water Sector Competency Framework’ – would be required. This framework was developed by the research team in consultation with invited sector specialists. The development process turned out to be an ongoing one, as new skills areas, or aspects thereof, were progressively discovered throughout the project. In its final form, the framework is a structured table of over 2500 skills required in the sector. It lays out all aspects of water sector functions (from water resources, environmental protection through to water services operations and maintenance (O&M)) and expands each function out through competency cluster, competency and individual skills levels. (WIN-SA 2015, pages 10-15; WRC 2015, pages 5-23.)

The process of determining the *demand for skills* in a WSI began by working through its Skills Matrix, using the Competency Framework by selecting a subset of skills required for each particular job title. Based on this process, the demand for skills per job title on the Skills Matrix was developed. In addition to determining the subset or demand for skills per job title, a rating of the level of competence was also required. A Likert scale was used where a score of 5 on the scale of 1 to 5 indicated full competence. Any task would require full competence in order for it to be performed properly.

Therefore the rating assigned to the level of competence while determining the demand for a skill would be evidence of an individual’s competence in the skill.

The process of determining the *supply of skills* in a WSI began with providing every technical staff member with the list of skills, per the Competency Framework, required for their position. Each staff member was then asked to identify the skills he or she possessed, and then to rate their own competence in each skill on the scale from 5 (indicating full competence) to 1. The meaning of the ratings 5 through 1 were provided to the WSI and each individual.

In HR terminology the assembly of all required skills per job title in one spreadsheet is referred to as the Skills Matrix of a WSI.

Therefore the rating assigned to the level of competence while determining the demand for a skill would be evidence of an individual's competence in the skill.

Pitfalls in self-assessment methods include insufficient comprehension by the individual (despite briefing by the assessment team) and bias on the part of the individual. Control of the self-assessment returns was chiefly exercised as follows:

When complete, the self-assessments were forwarded to line managers for their verification of the individuals' subset of skills and ratings. If the two assessments were different, a meeting between the individual, the line manager, a subject matter expert (if the line manager is not an expert) and an HR representative was convened to discuss the difference and agree a final rating. The final ratings of each individual were thereafter forwarded to the project team's member designated as the skills development facilitator. A summary of ratings of all staff was subsequently provided to WSI management for their skills planning information.

Dealing with multiple WSIs, individuals, job titles, sets of skills and ratings was best performed with up-to-date information and communications technology (ICT) to gather, analyse and disseminate the results. This project conceptualised and developed an online skills audit survey system which contained the full list of skills in the water sector competency framework for individual line managers and skills development facilitators to access.

The *skills gap* per skill per individual was determined by taking the demand for a skill (given a value of 5) and subtracting the supply of that skill. The project team then calculated numerical values for both demand and supply – summated them by competency, competency cluster and function level. This was presented in the form of a skills gap graph per individual, identifying the individual's training intervention required. Then all the individual ratings for the whole WSI were combined per skill and rolled up to a total score for competency, competency cluster and function, summarised in the form of a skills gap graph for the institution as a whole.

This Level I assessment method was applied to the five WSIs. It returned credible results for three of them, the exceptions being:

- DWS (Due to project budget limitations, it was not possible to establish the demand for skills at DWS. Thus only the supply of skills was determined. Whether these skills meet DWS's requirements is unknown.)
- The water board (Even though individual staff are highly skilled, the skills gap from the method turned out to be unrealistically high. This led the researchers to recommend that work be undertaken with other water boards to establish appropriate staffing norms for this type of WSI.)

With the very slow internet connections at the WSIs, the online skills audit survey system was slow. This challenge needs to be considered should the methodology be applied to other WSIs. The only other option could be to provide offline skills audit surveys for individuals to complete on their local computer.

Other features that could be coded into the online skills audit survey system are almost endless, but it is recommended that the following be prioritised should any further round of this type of intervention analysis be contemplated:

- automated data analysis
- production of skills gap reports and

- export of data directly to Workplace Skills Plans templates.

Applying the Skills Gap assessment, the same two WSIs as before returned the following results for the skills gaps:

Institution	Demand for skills (total value)	Supply of skills (total value)	Skills Gap (total value)	Supply of skills (percentage)	Skills Gap (percentage)
CMA	3 020	1 939	1 081	64%	36%
Water services authority	5 125	2 299	2 826	45%	55%

To reiterate how the skills gap assessment for a WSI was done:

- The individuals in the employ of that WSI themselves rated their own skills.
- These profiles (within the WSI) were compared in aggregate (i.e. the one was subtracted from the other) to the ratings of the skills sets for a hypothetical organogram designed to suit the needs of the infrastructure for which the WSI is responsible.
- The skills gap for the WSI was determined.

Level 2 and 3 Assessments

The project team visited each of the sample 18 WSIs, bringing back useful information regarding, principally:

- outsourcing of work; and
- HR management.

The extent to which a WSI outsources its duties is of course greatly material to the skills set which it needs to retain in-house. The surveys revealed that:

- Very little water resources or water services planning work was done in-house by WSIs. Out of the 18 WSIs, only two did a small percentage of this work in-house, otherwise all planning work was outsourced.
- A similar result was found with detailed design, construction work and water quality testing – almost all of it was outsourced to the private sector.
- It was only with O&M that this trend was reversed with approximately 80% of O&M work being done in-house by WSIs and 20% related to the O&M of specialised components outsourced to the private sector.

With respect to findings on HR management: Many WSIs reported having completed skills audits in the past five years but on closer investigation it turned out that they were referring to their completion of a Workplace Skills Plan (which is not a skills audit). While all WSIs have organograms, few carry out resource planning on a regular basis. Most WSIs used a combination of two HRMIS systems to house payroll and staff data. Most WSIs have job profiles for technical staff but the standard of the profiles varied greatly. Vacancies in technical departments averaged a high 24%. Retention strategies for technical staff were not very innovative in half of

institutions – these cited only medical aid, bursaries and learnerships as their primary strategies. Race equity has almost been achieved in technical posts in the water sector with 81%, 6%, 0% and 13% of positions being filled by Black, Coloured, Indian and White persons respectively. In technical posts, gender equity has not been achieved: 85% of staff are male.

Research products

The project developed three innovative products that hitherto did not exist in South Africa – certainly not in respect of the water sector. As follows:

- A Water Sector Competency Framework, a structured table of over 2500 skills required in the sector, specifying the required set of skills for each job title.
- A method, based on technical criteria of the nature of work and the extent of the responsibility (e.g. the quantum of infrastructure, and its nature and type and complexity), to determine the number of staff per job title required in three types of institutions, namely, Catchment Management Agencies, Water User Associations, and Water Services Authorities. (Acknowledging that the requirements of Water Boards need further work.)
- An online qualitative skills audit questionnaire for individuals to rate their own skills sets against the skills in the Competency Framework.

Another useful output of the project has been the identification, for a large number of individual WSI staff members, of skills shortfalls – that is, the specific differences between their current skills and the skills required for the posts to which they have been appointed. It is trusted that this is useful to the individuals themselves, and/or their employers – for them to address, if they wish to.

Conclusion

The project set out to develop a methodology to determine how capacity and skills gaps of service delivery institutions could be identified in respect of technical skills. This should be a first step to closing these gaps.

The project without question succeeded in developing this methodology, and showing how this determination could be done. Although applied to WSIs, it could, with adaptation, readily be applied to other service delivery institutions – e.g. institutions for electricity distribution, roads and stormwater delivery, solid waste management, and so on.

If there is the willingness to apply the methodology, it can:

- Research and explicitly identify the reasons for capacity and skills gaps in institutions.
- Measure the quantitative skills gap (per job title, institution and, if extrapolated, the country).
- Measure the qualitative skills gap (per individual, institution and, if extrapolated, the country).
- Thereby provide any WSI manager with factual comparative data to argue their staff situation, which ought to strengthen their case when motivating for additional staff and budgets.

The project generated new knowledge related to measuring capacity and skills gaps in WSIs, and:

- Developed a method that jointly focuses on the quantitative and qualitative aspects of the “lack of skills”, i.e. capacity and skills.
- Promoted a standardised methodology to measure capacity and skills.

To reiterate: The research project provided a soundly reasoned and systematic method of arriving at the evidence required to persuade top management of a WSI to make the necessary decisions on the skills shortfalls inhibiting service delivery. At a sector consultation workshop it was acknowledged that the methodology constituted best practice.

Whereas the resolutions of the workshop included a recommendation that the methodology be rolled out to all WSIs, the delegates acknowledged the challenge involved in persuading many WSIs to employ the methodology.

Recommendation

The culmination of this project was a recommendation that DWS, in partnership with the Energy and Water Sector Education and Training Authority (EWSETA), take the lead under the guidance of the DWS Water Services Leadership Group to roll-out the Capacity Gap and Skills Gap methods to all WSIs in South Africa. By using these standard methodologies across all WSIs the capacity gaps and the individual and institutional skills gaps could be aggregated to give government a complete nationwide picture of the capacity gap and skills gap in the sector. Repeating the process at regular intervals would allow monitoring of the improvement in the situation.

Regrettably, however, there has since completion of the project been little attempt by DWS to persuade WSIs to perform the skills intervention analysis on themselves – or even on itself (DWS), for that matter. The initiative has not been sufficiently prioritised by the Department. Furthermore, as far as is known, few WSIs have of their own accord even partially adopted the approach across their institutions as a whole.

More advocacy work is needed to enhance buy-in from these critically important role players.

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